Issued MARCH 1967

SOIL SURVEY
Greer County, Oklahoma

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
OKLAHOMA AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1957–62. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1962. This survey was made cooperatively by the Soil Conservation Service and the Oklahoma Agricultural Experiment Station; it is part of the technical assistance furnished to the Greer County Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY REPORT

THIS SOIL SURVEY of Greer County contains information that can be applied in managing farms, ranches, and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All the soils of Greer County are shown on the detailed map at the back of this report. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the report. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit, range site, and windbreak group in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the interpretative groupings.

Foresters and others can refer to the section "Woodland, Windbreaks, and Post Lots," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others concerned with wildlife will find information about soils and wildlife in the section "Wildlife."

Ranchers and others interested in range can find, under "Range Management," groupings of the soils according to their suitability for range and descriptions of the vegetation on the soils of each range site.

Engineers and builders will find under "Engineering Properties of the Soils" tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation, Classification, and Morphology of Soils."

Students, teachers, and others will find information about soils and their management in various parts of the text, according to their particular interest.

Newcomers in Greer County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County," which gives additional information.

Cover picture: **Cotton on Tipton loam, 0 to 1 percent slopes.**

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NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

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EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas and Eldorado Valleys Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF GREER COUNTY, OKLAHOMA

BY JIMMIE W. FRIE, R. C. BRINLEE, AND RICHARD D. GRAFT, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE OKLAHOMA AGRICULTURAL EXPERIMENT STATION

GREER COUNTY is in the southwestern part of Oklahoma (fig. 1). It has a total area of 637 square miles, or 407,680 acres. Mangum is the county seat.

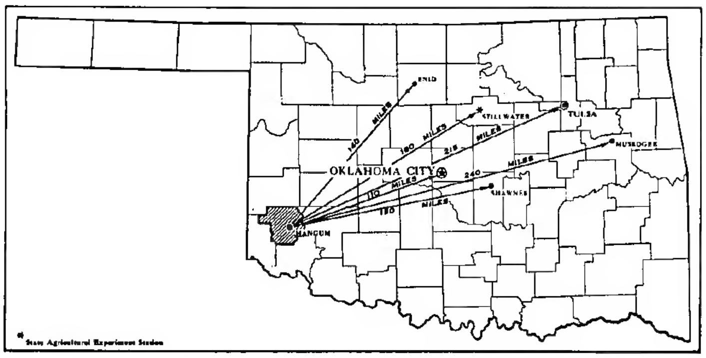

Figure 1.—Location of Greer County in Oklahoma.

The county is largely agricultural. Wheat, cotton, sorghum, and alfalfa are the main crops. Beef cattle are raised. Dairy products provide a large part of the income on a few farms.

How Soils Are Mapped and Classified

Soil scientists made this survey to learn what kinds of soils are in Greer County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Spur and Enterprise, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the natural, undisturbed landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series all the soils having a surface layer of the same texture belong to one soil type. Spur clay loam and Spur loam are two soil types in the Spur series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Enterprise very fine sandy loam, 1 to 3 percent slopes, is one of four phases of Enterprise very fine sandy loam, a soil type that has a slope range of 0 to 8 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this report was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within

an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed or occur in individual areas of such small size that it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Cottonwood-Acme complex or Vernon-Weymouth complex, 10 to 20 percent slopes. Another kind of mapping unit is the undifferentiated group, which consists of two or more soils that may occur together without regularity in pattern or relative proportion. The individual tracts of the component soils could be shown separately on the map, but the differences between the soils are so slight that the separation is not important for the objectives of the soil survey. An example is Miles and Altus fine sandy loams, 0 to 1 percent slopes.

Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Rock outcrop or Rough broken land, and are called land types rather than soils.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland and rangeland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey reports. On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then adjust them according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this report shows, in color, the soil associations in Greer County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The general soil map of Greer County shows 9 soil associations. Associations 1 through 5 are on nearly level to steep uplands. Association 6 is on rough breaks of the uplands. Associations 7 and 8 are on flood plains of the Elm, Salt, and North Forks of the Red River, and association 9 occupies terraces above the streams.

1. Miles-Springer-Tivoli association

Nearly level to strongly sloping soils of the uplands that formed in material blown from old alluvium

This soil association is on nearly level to strongly sloping uplands in which there are a few dunes. Most of the association lies east of Willow, east of Mangum, and near Russell. The soils formed under tall prairie grass in material blown from old alluvium. This association is the largest in the county and covers about 24 percent of the total acreage.

The Miles, Springer, and Tivoli soils are dominant (fig. 2). The Miles soils, the most extensive in the association, are nearly level to sloping, well drained, and moderately permeable. They have a surface layer of brown fine sandy loam or loamy fine sand and a subsoil of reddish-brown sandy clay loam.

The Springer soils are gently to strongly sloping, well drained, and moderately rapid in permeability. Their surface layer is brown loamy fine sand, and their subsoil is reddish-brown sandy loam.

The Tivoli soils are excessively drained, rapidly permeable soils on stabilized dunes within areas of Springer soils or adjacent to large streams. They have a surface layer of brown loamy fine sand or fine sand and a subsoil of reddish-yellow fine sand.

Also in the association are Wet alluvial land, which occupies narrow bottoms where the water table is high, and Eroded sandy land. Minor soils are the Altus, Brownfield, Mansic, Meno, Nobscot, and Spur.

Much of the acreage in this association is cultivated. Cotton is the main crop, but wheat, rye, alfalfa, peanuts, and grain sorghum also are grown. Fertility ranges from low to high, and in some places a fertilizer containing nitrogen and phosphate is applied to increase yields. The Miles and Springer soils are suitable for irrigation. The Tivoli soils are too sandy and droughty for cultivated crops and are mostly in grass.

The chief hazards in managing the cultivated soils in this association are erosion and rapid loss of fertility. Most areas of native range are small and have been heavily grazed. Wells equipped with windmills are the main source of water for livestock.

2. St. Paul-Woodward-Quinlan association

Nearly level to steep soils of the uplands that formed in old alluvium or in material from sandstone

This soil association occurs in the north-central and northwestern parts of the county and is made up of

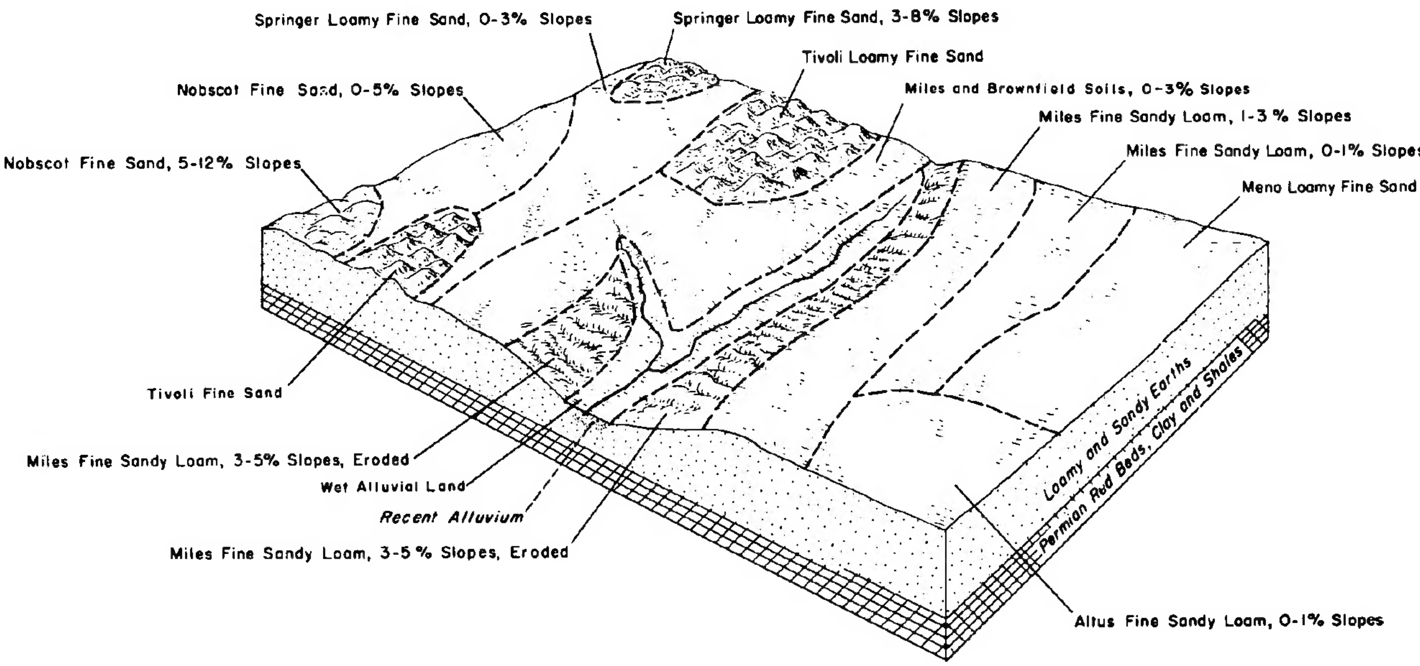

Figure 2.—**Major soils in soil association 1, and their relation to the landscape.**

broad, nearly level to sloping uplands dissected by drainageways that have strongly sloping to steep sides. These soils formed under a cover of short to tall prairie grasses in material weathered from sandstone or in old alluvium. The association occupies about 15 percent of the county.

Dominant are the St. Paul, Woodward, and Quinlan soils (fig. 3). The St. Paul soils, the most extensive in the association, occur on broad, well-drained flats and have moderately slow permeability. Their surface layer is dark-brown silt loam, and their subsoil is dark-brown or reddish-brown, blocky silty clay loam. These soils formed in old alluvium or in calcareous material weathered from sandstone.

The Woodward soils occur in gently sloping or sloping areas and are calcareous, well drained, and moderately permeable. Both the surface layer and the subsoil are brown or reddish-brown loam. The Woodward soils formed in calcareous material weathered from sandstone.

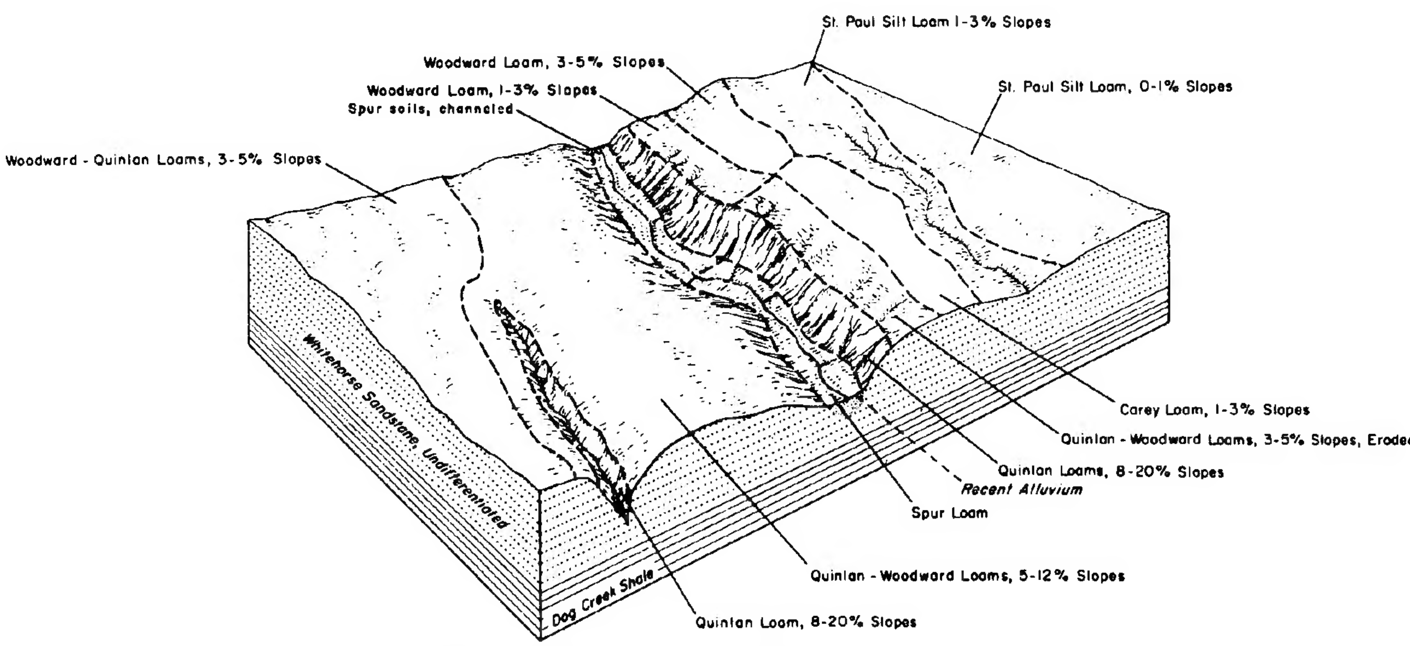

Figure 3.—**Major soils in soil association 2, and their relation to the landscape.**

The Quinlan soils are calcareous, somewhat excessively drained, moderately permeable soils that occupy the steep side slopes of drains. They have a thin, reddish-brown loam surface layer that is underlain by reddish sandstone. In some places the Quinlan soils are mapped with the Woodward soils as sloping to moderately steep areas of Quinlan-Woodward loams.

Also in the association are the gently sloping Carey soils, and the Spur and Yahola soils, which are on narrow flood plains.

Nearly all of this association is cultivated, though a small acreage is in native range. Wheat is the main crop on the St. Paul and Woodward soils, but cotton, barley, oats, alfalfa, and grain sorghum also are grown. The Quinlan soils and the Quinlan-Woodward loams are too shallow or too steep for cultivation and are in native grass. Fertility in the St. Paul and Woodward soils is good to fair. In a few places nitrogen fertilizer is applied to increase yields or to speed decomposition of straw used for soil improvement. The St. Paul and Woodward soils are suitable for irrigation. In years when rainfall is favorable, fields sown to winter wheat provide excellent pasture for beef cattle.

Controlling water erosion and conserving moisture are the most important needs on the cultivated soils in this association. Mesquite and sand sagebrush generally invade native range that is not properly managed. Farm ponds, which have been constructed in many of the more strongly sloping drainageways, provide adequate water for livestock. In selecting sites for ponds, care must be taken to avoid outcrops of gypsum.

3. Hollister-Tillman association

Nearly level soils of the broad uplands that formed in old alluvium or in material from clay and shale

Broad, nearly level uplands and a few sloping drainageways make up this soil association. The main areas are near Jester and Willow and in the southeastern part of the county. The soils formed under a cover of mud and short prairie grasses in marine clay and weathered shale or in old alluvium. About 10 percent of the county is in the association.

The Hollister and Tillman soils are dominant (fig. 4). The Hollister soils occur in broad, nearly level areas and are well drained and slowly permeable. These soils have a surface layer of dark grayish-brown clay loam and a subsoil of dark grayish-brown or grayish-brown, blocky silty clay or clay. They formed in calcareous old alluvium.

The Tillman soils are nearly level or gently sloping, well drained, and very slowly permeable. Their surface layer is brown or reddish-brown clay loam, and their subsoil is reddish-brown, blocky clay. They formed in calcareous material, either marine clay or weathered shale.

The Abilene soils are dominant near Willow. They are nearly level, slowly permeable, well-drained soils that have a dark grayish-brown surface layer and a subsoil of grayish-brown, blocky clay loam. They formed in calcareous old alluvium.

Also in the association are the Spur soils, which are on narrow flood plains, the gently sloping, moderately deep Acme soils, which are on uplands and formed in weathered gypsum, and the Weymouth and Vernon soils.

Nearly all this association is cultivated. Wheat is the main crop, but other common crops are grown with limited success. Although the soils are fertile or fairly fertile, they are droughty and are best suited to small grain. In years of favorable moisture, yields are increased if nitrogen fertilizer is applied. Nitrogen also speeds the decomposition of straw used for improving the soil. Fields sown to winter wheat provide excellent pasture for beef cattle in years when moisture is favorable. The Hollister, Tillman, and Abilene soils are suitable for irrigation.

4. Lawton association

Nearly level to steep soils of the uplands that formed in material from granitic outwash

This soil association occupies nearly level or gently sloping uplands that are broken by steep, stony hills. Scattered areas are dissected by narrow, indistinct drainageways. Isolated hills, which are the westernmost part of the Wichita Mountains, rise 100 to 500 feet above the plain. The largest area of this association is in the east-central part of the county near Granite, but other large areas are in the west-central and central parts. These soils formed under mid and tall prairie grasses in material derived from granitic outwash. The association makes up about 8 percent of the county.

The Lawton soils, which are on nearly level to sloping uplands, are dominant (fig. 5). They are well drained and have moderately slow permeability. Their surface layer is dark-brown loam, and their subsoil is reddish-brown, blocky clay loam. These soils are free of calcium carbonate. Scattered through them, in most places, are small granitic pebbles. Beds of these pebbles underlie the soils near Granite, and boulders of solid granite underlie the soils near the base of the steep, stony hills. In still other parts of the association, the pebbles are lacking and the Lawton soils are underlain by stratified sand, silt, and clay. Gravelly Lawton soils occur on the foot slopes of the Wichita Mountains.

Also in this association are the Hollister and Spur soils and Rock outcrop.

Much of this association is cultivated. Wheat and cotton are the main crops, but alfalfa, grain sorghum, and other small grain also are grown. Rock outcrop and soils of the Lawton gravelly complex are too stony for cultivation. Fertility is good in the Lawton soils. In years when the moisture supply is adequate, nitrogen fertilizer is applied in a few places to increase yields or to help decompose straw used for improving the soil. When the moisture supply is adequate, fields sown to winter wheat provide excellent pasture for beef cattle. The nearly level Lawton soils are suitable for irrigation.

Controlling erosion, conserving water, and maintaining good tilth are the chief management problems on the cultivated soils in this association. The gravelly Lawton soils and Rock outcrop are mainly in native range. Ponds constructed in drainageways provide water for livestock.

5. La Casa-Weymouth association

Gently sloping and sloping soils of the uplands that formed in material from calcareous shale and clay

This soil association is made up of calcareous, gently sloping and sloping soils on uplands that, in a few places, are cut by drainageways that have strongly slop-

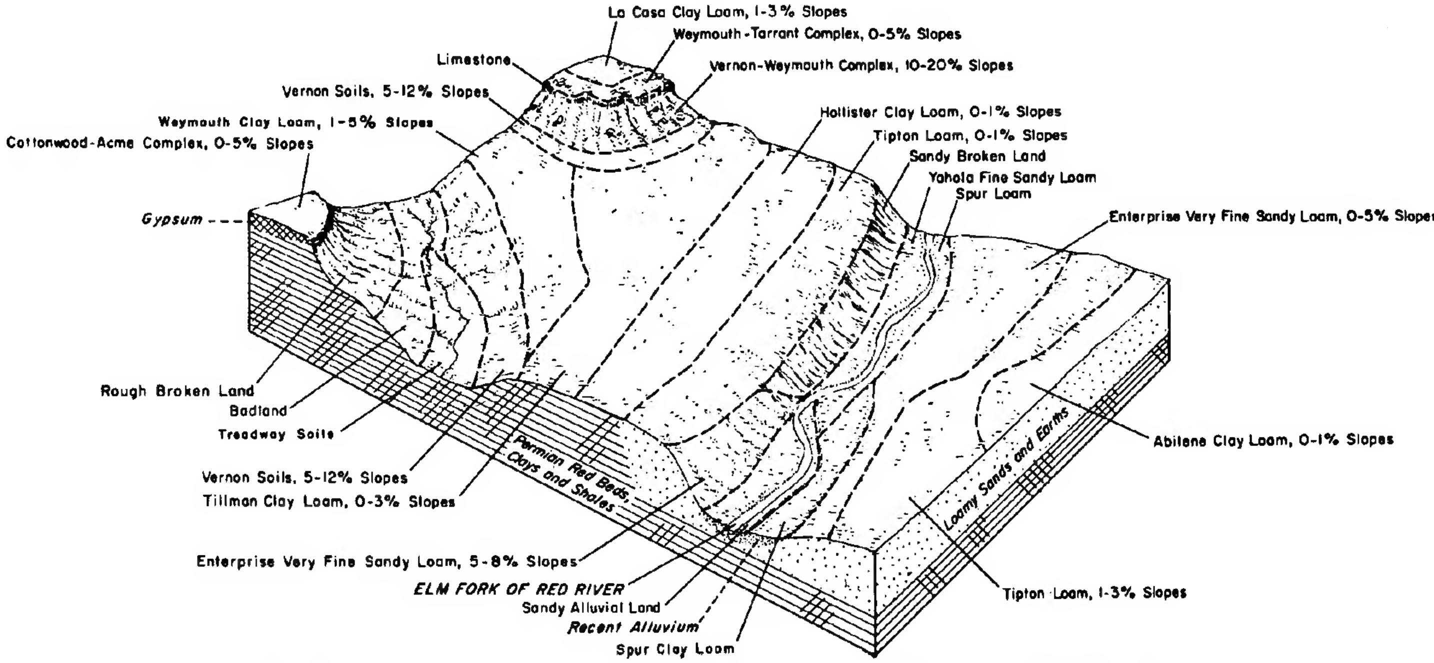

Figure 4.—**Major soils in soil associations 3, 7, and 9, and their relation to the landscape.**

ing to steep sides. Most of this association is in the southwestern part of the county. The soils formed under a cover of mid and short prairie grasses in material from calcareous shale or clay that contained layers of dolomitic limestone. This association makes up about 8 percent of the county.

Dominant in this association are the La Casa and Weymouth soils. The La Casa soils, which are the most extensive, are well drained and have moderately slow permeability. They have a surface layer of dark-brown clay loam and a subsoil of reddish-brown, blocky clay loam. The subsoil is underlain, in most places, by a layer of accumulated calcium carbonate. These soils formed in material weathered from strongly calcareous clay or shale that contained layers of dolomitic limestone. They are dominant in the gently sloping parts of the association.

The Weymouth soils are strongly calcareous, well drained, and moderately slow in permeability. They have a surface layer of dark-brown clay loam and a sub-

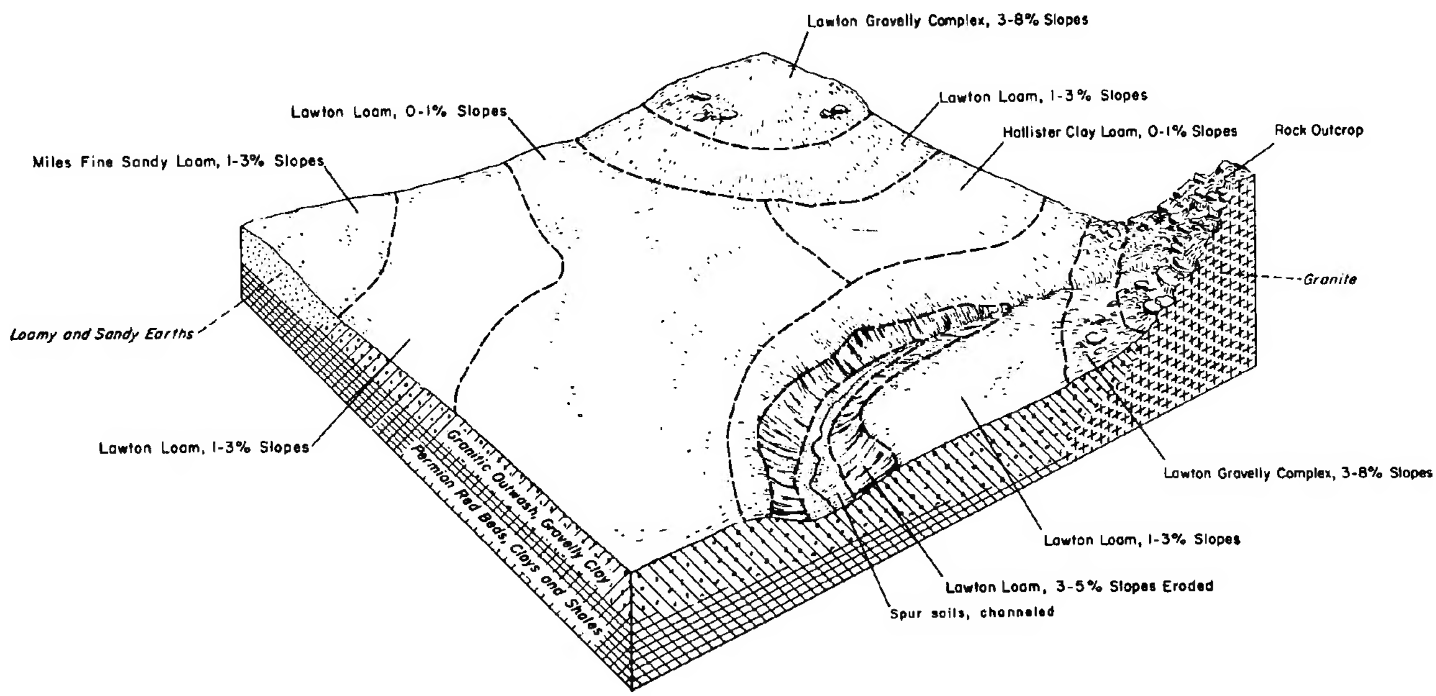

Figure 5.—**Major soils in soil association 4, and their relation to the landscape.**

soil of reddish-brown, granular clay loam. Below the subsoil a layer of calcium carbonate has accumulated. Like the La Casa soils, the Weymouth soils formed in material from strongly calcareous clay or shale that contained layers of dolomitic limestone. They occur in gently sloping and sloping areas.

The Tarrant soils, which are intermingled with the Weymouth soils in some places, have a surface layer of dark-brown loam that is shallow over dolomitic limestone, fragments of which occur on the surface. Also in this association are areas of the channeled Spur soils, the Tillman soils, the Vernon soils, and Rough broken land.

Much of the acreage of the La Casa and Weymouth soils is cultivated, mainly to wheat but partly to other small grain, cotton, and grain sorghum. These soils are fair to good in fertility, but because they are droughty they are better suited to small grain than to other crops. Nearly all the acreage of the Weymouth-Tarrant complex is in native range. Many of the range areas are small and are difficult to manage.

Controlling water erosion, conserving moisture, and maintaining good tilth are the main management problems. Water for livestock is provided by constructing ponds in drainageways.

6. Badland-Rough broken land association

Gently sloping to steep, rough breaks of the uplands

This association is rugged and is dissected by steep escarpments, below which the relief generally is gently sloping or sloping. Rocks of the Permian red beds are exposed in a few areas that are gullied by many shallow, intermittent drainageways. This association is mainly in the western part of the county, adjacent to the Elm and Salt Forks of the Red River and their tributaries. It makes up about 21 percent of the county.

Dominant in the association are Badland and Rough broken land, but present also are fairly large areas of the Vernon and Weymouth soils.

Badland occupies short, steep escarpments and gullied, gently sloping foot slopes. All the acreage is in native range vegetation consisting of short grasses, mesquite, and pricklypear. The stands are sparse and produce little forage for grazing.

Rough broken land consists of steep escarpments and the intervening canyons. All of it is in native range plants, mainly mid and tall grasses, that furnish only limited grazing because of the steep slopes.

The Vernon and Weymouth soils occur as a complex on sloping to steep uplands where layers of gypsum or dolomitic limestone form steps, or ledges. All areas of these soils are in native range and are used for grazing. Tall and mid grasses make up most of the vegetation and produce moderate to good amounts of forage.

Also in the association are the Cottonwood, Acme, Treadway, Mangum, and channeled Spur soils.

Much of this association is in native range, but management is difficult. Forage production ranges from very poor to good. Needed are practices that control water erosion, increase fertility, and maintain or increase yields. Overgrazing should be prevented. In winter, areas of Rough broken land and Badland help to protect livestock from wind, and they provide poor to good grazing.

A few ranches in this association are several hundred acres in size, but more are about 640 acres. In many places water for livestock has been provided by constructing farm ponds or, with limited success, by digging wells and equipping them with windmills. Where the soils contain gypsum, care must be taken in selecting sites for ponds.

7. Sandy alluvial land-Yahola association

Nearly level soils of the flood plains that formed in sandy alluvium washed from soils of the prairies

This association is made up of calcareous, nearly level soils on the flood plains of the Elm, Salt, and North Forks of the Red River. Tall prairie grasses make up the native vegetation. This association covers about 5 percent of the county.

Sandy alluvial land and the Yahola soils are dominant (see fig. 4). Sandy alluvial land occurs on nearly level to billowy flood plains that are occasionally to frequently overflowed. The surface layer is variable but, in most places, is brown loamy fine sand. It is underlain by pink fine sand that resembles the recent sediments in the streambeds. The soil material is calcareous throughout. Water received as rainfall moves rapidly through the soil, but the water table generally is within reach of deep-rooted plants.

The Yahola soils are on nearly level flood plains that are occasionally overflowed. As a rule, they are higher above the streambed than Sandy alluvial land. Their surface layer is brown fine sandy loam, and their subsoil is reddish-brown fine sandy loam. These soils are well drained, are calcareous throughout, and have moderately rapid permeability. They store a moderate amount of moisture that plants can use.

The Tivoli soils also make up part of this association.

About 65 percent of the acreage of the Yahola soils is cultivated, mainly to cotton, wheat, and alfalfa, but also to grain sorghum and to other small grains besides wheat. Fertility is fair to good. In years when the moisture supply is adequate, a fertilizer containing nitrogen and phosphorus is applied to increase yields. Sandy alluvial land is almost all in native range. When the range is well managed, the vegetation is mostly tall grasses.

Good range management is needed on this association if good yields of forage are to be obtained. The main hazards are wind erosion, droughtiness, and overwash from floods.

8. Spur-Mangum association

Nearly level soils of the flood plains that formed in loamy and clayey alluvium washed from soils of the uplands

In this association are calcareous, nearly level soils on the flood plains of the Elm Fork of the Red River and its tributaries. These soils formed under tall and mid prairie grasses in loamy and clayey alluvium washed from soils of the uplands. This association makes up about 6 percent of the county.

The Spur and Mangum soils are dominant. The Spur soils, which formed in loamy alluvium, are mainly nearly level, are well drained, and have moderate to moderately slow permeability. Their brown surface layer and reddish-brown subsoil are loam or clay loam. These soils occur mainly along the Elm Fork of the Red River and are occasionally flooded.

The Mangum soils formed in clayey alluvium and are dominant in nearly level areas that are occasionally

overflowed. The largest areas are along Haystack Creek and its tributaries. These soils are well drained and very slowly permeable. Their surface layer is dark-brown clay, and their subsoil is massive, reddish-brown clay.

Also in this association are the Treadway and Yahola soils.

Nearly all areas of the Spur soils are cultivated. Wheat, cotton, and alfalfa are the main crops, but other common crops also are suited. In years that have adequate moisture, winter wheat provides excellent pasture for beef cattle. Fertility generally is high. The main management needs are maintaining good tilth and protecting the cultivated fields from overflow.

The Mangum soils are mainly in mid and tall native grasses and are used for grazing. If they are well managed, they produce good yields of forage. Some areas have been cultivated with limited success, but range is the better use because these soils are droughty.

9. Tipton-Enterprise association

Nearly level to strongly sloping soils of the terraces that formed in alluvium or wind-deposited material

This soil association is made up of nearly level to strongly sloping soils on terraces along the Salt Fork and the North Fork of the Red River. The largest area is near Hester. The soils formed under tall and mid prairie grasses in alluvium or wind-deposited material. The association covers about 3 percent of the county.

Dominant are the Tipton and Enterprise soils (see fig. 4). The Tipton soils formed in alluvium and are mainly on nearly level and gently sloping terraces. They are well drained and moderately permeable. Their surface layer is dark-brown loam, and their subsoil is dark-brown or brown clay loam.

The Enterprise soils, which formed in wind-deposited material, occur partly on the nearly level or gently sloping terraces and partly on the sloping or strongly sloping breaks between the terraces and the bottom lands. These soils are alkaline throughout and are well drained and moderately permeable. They have a brown or dark-brown surface layer and a brown or reddish-brown subsoil, both of which are very fine sandy loam.

Also in this association are small areas of the Abilene and Miles soils.

Wheat, cotton, and alfalfa are grown on nearly all the acreage of the Tipton soils and of the nearly level to sloping Enterprise soils. Most areas of the strongly sloping Enterprise soils are in native grasses and, if well managed, produce good yields of forage. The soils in this association are fertile or highly fertile. In years when the moisture supply is adequate, yields increase if a nitrogen fertilizer is applied. A large acreage of the Tipton soils is irrigated.

Conserving moisture, controlling erosion, and maintaining good tilth are the main problems on the cultivated soils in this association. Water for livestock generally is obtained from wells equipped with windmills.

Descriptions of the Soils

In this section each soil series is described and a profile typical of the series is given. Each mapping unit is then discussed, and any differences from the typical profile are pointed out. The present use and some of the management problems are given for each mapping unit.

Near the back of the report is a "Guide to Mapping Units," which lists the soils mapped in the county and the capability unit, range site, and windbreak group for each soil. The approximate acreage and the proportionate extent of the soils are given in table 1. The location and distribution of the soils are shown on the soil map at the back of the report.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Abilene clay loam, 0 to 1 percent slopes	6, 845	1. 7
Acme clay loam, 1 to 3 percent slopes	765	. 2
Altus fine sandy loam	2, 635	. 6
Badland	17, 540	4. 3
Carey loam, 1 to 3 percent slopes	720	. 2
Cottonwood-Acme complex	9, 690	2. 4
Enterprise very fine sandy loam, 0 to 1 percent slopes	880	. 2
Enterprise very fine sandy loam, 1 to 3 percent slopes	1, 805	. 4
Enterprise very fine sandy loam, 3 to 5 percent slopes	2, 575	. 6
Enterprise very fine sandy loam, 5 to 8 percent slopes	1, 185	. 3
Eroded sandy land	2, 410	. 6
Hollister clay loam, 0 to 1 percent slopes	19, 750	4. 8
La Casa clay loam, 1 to 3 percent slopes	13, 710	3. 4
Lawton loam, 0 to 1 percent slopes	15, 540	3. 8
Lawton loam, 1 to 3 percent slopes	12, 630	3. 1
Lawton loam, 3 to 5 percent slopes, eroded	835	. 2
Lawton gravelly complex, 3 to 8 percent slopes	2, 285	. 6
Mangum clay	7, 360	1. 8
Mansic clay loam, 0 to 1 percent slopes	1, 055	. 3
Meno and Altus loamy fine sands	3, 905	1. 0
Miles fine sandy loam, 3 to 5 percent slopes	3, 525	. 9
Miles fine sandy loam, 3 to 5 percent slopes, eroded	4, 600	1. 1
Miles and Altus fine sandy loams, 0 to 1 percent slopes	7, 475	1. 8
Miles and Altus fine sandy loams, 1 to 3 percent slopes	17, 930	4. 4
Miles and Brownfield soils, 0 to 3 percent slopes	17, 270	4. 2
Nobscot fine sand, 0 to 5 percent slopes	3, 385	. 8
Nobscot fine sand, 5 to 12 percent slopes	1, 320	. 3
Quinlan loam, 8 to 20 percent slopes	2, 705	. 7
Quinlan-Woodward loams, 3 to 5 percent slopes, eroded	5, 280	1. 3
Quinlan-Woodward loams, 5 to 12 percent slopes	7, 255	1. 8
Rock outcrop	3, 615	. 9
Rough broken land	12, 495	3. 1
Sandy alluvial land	7, 870	1. 9
Sandy broken land	7, 610	1. 9
Springer loamy fine sand, 0 to 3 percent slopes	10, 785	2. 6
Springer loamy fine sand, 3 to 8 percent slopes	8, 135	2. 0
Spur clay loam	11, 265	2. 8
Spur loam	8, 050	2. 0
Spur soils, channeled	5, 565	1. 4
St. Paul silt loam, 0 to 1 percent slopes	21, 375	5. 2
St. Paul silt loam, 1 to 3 percent slopes	14, 440	3. 5

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TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Tillman clay loam, 0 to 1 percent slopes	2, 340	0. 6	Weymouth clay loam, 3 to 5 percent slopes, eroded	1, 950	0. 5
Tillman clay loam, 1 to 3 percent slopes	9, 790	2. 4	Weymouth-Tarrant complex, 0 to 5 percent slopes	9, 130	2. 2
Tipton loam, 0 to 1 percent slopes	5, 615	1. 4	Woodward loam, 1 to 3 percent slopes	3, 290	. 8
Tipton loam, 1 to 3 percent slopes	1, 185	. 3	Woodward loam, 3 to 5 percent slopes	2, 150	. 5
Tivoli fine sand	4, 710	1. 2	Woodward-Quinlan loams, 3 to 5 percent slopes	1, 375	. 3
Tivoli loamy fine sand	4, 590	1. 1	Yahola fine sandy loam	5, 835	1. 4
Treadway soils	3, 850	. 9	River channels	4, 755	1. 2
Vernon soils, 5 to 12 percent slopes	14, 750	3. 6			
Vernon-Weymouth complex, 10 to 20 percent slopes	17, 235	4. 2	Total	407, 680	100. 0
Wet alluvial land	3, 600	. 9			
Weymouth clay loam, 1 to 3 percent slopes	1, 475	. 4			
Weymouth clay loam, 3 to 5 percent slopes	3, 985	1. 0			

Abilene Series

The Abilene series consists of deep, dark-colored, nearly level soils of the uplands. These soils formed under short and mid grasses in calcareous old alluvium. They are minor in extent and occur near Hester and Willow.

The surface layer is grayish-brown, noncalcareous, friable clay loam about 14 inches thick. This layer has granular structure and is easily tilled.

The subsoil, about 28 inches thick, is clay loam of blocky structure. It is dark grayish brown and friable in the upper part and is grayish brown, firm, and calcareous in the lower part.

Grayish-brown clay loam is the underlying material. It is several feet thick, is structureless, and has a high content of calcium carbonate.

The Abilene soils are well drained. Runoff is slow, internal drainage is medium, and permeability is slow. Although the available water capacity is high, productivity is somewhat limited by the moisture supply.

Small grain is well suited to the fertile and productive Abilene soils. In years of below-normal rainfall, yields of cotton, sorghum, and legumes are uncertain. Conserving moisture and maintaining soil structure are the main problems of management. The soils are suitable for irrigation.

Abilene clay loam, 0 to 1 percent slopes (AbA).—This is the only Abilene soil mapped in Greer County. It occurs on uplands and is nearly level and well drained. In some places a concentration of salts makes the soil lighter colored than surrounding areas, and a whitish crust tends to form on the surface after rains and between cultivations.

Included in mapping were a few small areas of the Hollister soils, which have a thinner surface layer and generally a more clayey subsoil than this soil. Also included were some small areas of the St. Paul soils, which have a more reddish subsoil and, in the Hester community, a few small areas of the Altus and the Miles soils.

The plow layer of this Abilene soil is easily worked, but it is pulverized and more likely to blow if it is excessively tilled. Under good management this soil is highly productive. The available water capacity is high; water passes through the soil at a slow rate.

Nearly all of this soil is used for cultivated crops. Small grain does best. Cotton, sorghum, and legumes are likely to fail in years of below-normal rainfall. The soil is suitable for irrigation. (Capability unit IIc-1; Hardland range site; Windbreak group 4)

Acme Series

The Acme series consists of moderately deep, dark-colored, gently sloping soils on uplands. These soils formed under tall and mid grasses in beds of slightly weathered gypsum that contained a large amount of calcium carbonate or from soft, calcareous, impure gypsum that was redeposited by water. The soils occur in small areas near Jester.

The surface layer, about 10 inches thick, is dark grayish-brown, friable, calcareous light clay loam. It has granular structure and is easily tilled.

The subsoil is brown, friable clay loam about 14 inches thick. It is calcareous and has blocky structure.

The underlying material is whitish gypsum that is impure and contains a large amount of calcium carbonate.

The Acme soils are well drained and have moderate to high available water capacity. Runoff and internal drainage are medium, and permeability is moderate. If these soils are used for cultivated crops, practices are needed that control erosion, maintain soil structure, increase water intake, and decrease droughtiness.

Acme clay loam, 1 to 3 percent slopes (AcB).—This is the only Acme soil mapped separately in Greer County. It is a well-drained soil on gently sloping uplands near Jester.

A few small areas of the Cottonwood and the Hollister soils were mapped with this soil; they make up less than 13 percent of any area. The Cottonwood soils are more shallow to gypsum than this Acme soil, and the Hollister soils are deeper, more clayey, and more slowly permeable.

The plow layer of this soil is easily worked, but if it is tilled excessively, it is pulverized and blows more easily. This soil is moderately productive if it is well managed. Water passes through it at a moderate rate; the available water capacity is moderate.

About three-fourths of the acreage is cultivated. Small grain is the best suited crop. Yields of cotton, sorghum, and legumes are uncertain because the soil is droughty and susceptible to water erosion. Irrigation is suitable.

(Capability unit IIIe-1; Loamy Prairie range site; Windbreak group 4)

Altus Series

The Altus series consists of deep, coarse textured and moderately coarse textured, dark-colored soils that formed under tall and mid grasses in calcareous old alluvium. These soils are inextensive and occur on nearly level and gently sloping uplands that are scattered throughout the county. The depth to the water table normally is 8 to 15 feet, but it may be 3½ feet during cool, wet years.

The surface layer is grayish-brown fine sandy loam about 15 inches thick. This layer is slightly acid or neutral in reaction, has granular structure, and is easily tilled.

The subsoil is about 30 inches thick. The upper part of it is dark-brown or dark grayish-brown sandy loam or sandy clay loam, is neutral in reaction, and has granular or blocky structure. The lower part is reddish brown, neutral or mildly alkaline, and firm and has blocky structure.

The underlying material is yellowish-red sandy clay loam that is mottled with red, gray, and yellow. It is neutral or mildly alkaline in reaction.

The Altus soils are well drained. Internal drainage is medium, runoff is slow, and permeability is moderate. The rate of water intake is good, and the available water capacity is moderate. The main management problems are controlling water erosion and wind erosion and maintaining soil structure and fertility.

Altus fine sandy loam (At) (0 to 1 percent slopes).—This is the only Altus soil mapped in Greer County. It is a well-drained soil on uplands. The largest area is southeast of Mangum. In some places salts have concentrated in this soil. In these places the surface layer is lighter colored than that of the surrounding soils, and a whitish crust tends to form on the surface after rains and between cultivations.

Included with this soil in mapping were a few areas in which the plow layer is sandy loam because winds have blown away the finer material. Also included were some areas that have a layer of grayish clay loam at a depth of 35 to 50 inches and small areas of the Miles and the Abilene soils.

This Altus soil is easy to keep in good tilth and can be worked within a wide range of moisture content without clodding or crusting. Under good management it is moderately productive. Water passes through it at a moderate rate; the available water capacity is moderate. In wet periods the water table is within 40 to 50 inches of the surface.

Nearly all of this soil is cultivated, mainly to cotton, grain sorghum, and wheat. Among the other crops grown are alfalfa, sweetclover, cowpeas, guar, vetch, and rye. Crops respond to fertilizer if it is applied in amounts determined by soil tests. The soil is suitable for irrigation. (Capability unit IIe-2; Sandy Prairie range site; Windbreak group 1)

Badland

Badland (Ba) consists of steep escarpments and rough areas that include gently sloping flat places. Geologic erosion has been severe (fig. 6), and little or no soil formation has taken place. Erosion has exposed the red clay beds, shales, and gypsiferous shales of Permian age.

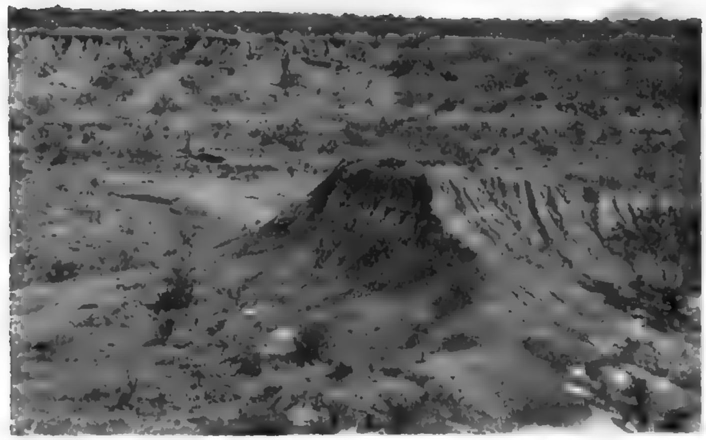

Figure 6.—**An area of Badland that shows the effects of erosion and the sparse cover.**

Areas of Badland are 10 acres or more in size. Normally, those of less than 10 acres were mapped with the Vernon soils or as Rough broken land. Mapped with this land type were a few areas of the Treadway soils, which are alluvial soils on narrow drains, and small areas of Vernon soils, which occur as isolated flat areas.

Badland is very slowly permeable to air, water, and roots, and nearly all rainfall runs off. Fertility is low, and the shrink-swell potential is high. Consequently, this unit is not suitable for cultivation and has little value for grazing. Most of its acreage, however, is within areas that are used for range. (Capability unit VIIs-1; Eroded Red Clay range site; Windbreak group 5)

Brownfield Series

The Brownfield series consists of deep, light-colored soils that formed under shinnery oak and tall grasses. These soils occur throughout the county on nearly level or gently sloping uplands.

The surface layer is pale-brown, slightly acid fine sand about 18 inches thick. Water passes through it rapidly.

The subsoil, about 26 inches thick, is slightly acid sandy clay loam that is reddish brown in the upper part and yellowish red in the lower part. This layer has prismatic structure.

Below the subsoil is yellowish-red sandy loam. It is neutral in reaction.

Brownfield soils are well drained. Runoff is slow, and permeability and internal drainage are moderate. The fertility is low, but crops respond well to fertilizer when rainfall is normal or above. Wind erosion is a hazard.

In this county the Brownfield soils are mapped only with the Miles soils.

Carey Series

The Carey series consists of deep, brown to reddish-brown, gently sloping soils on uplands. These soils formed under tall and mid grasses in weakly consoli-

dated, calcareous, fine-grained sandstone. They occur near Plainview and are minor in extent.

The surface layer is neutral, brown loam about 12 inches thick. It has granular structure and is easily tilled.

The subsoil is reddish-brown clay loam. It has prismatic structure and is neutral or mildly alkaline in reaction.

The underlying material is calcareous, red loam.

These soils are well drained, have medium runoff and internal drainage, and are moderately permeable. Their water-intake rate is good, and their available water capacity is high.

The Carey soils are fertile and productive. The main problems in managing them are controlling water erosion and maintaining fertility and soil structure. Cotton, small grain, and alfalfa are the main crops. These soils are suitable for irrigation.

Carey loam, 1 to 3 percent slopes (CaB).—This is the only Carey soil mapped in the county. It occurs on uplands and is gently sloping and well drained.

Mapped with this soil were a few areas of the Woodward soils, which have fewer layers and are shallower to calcium carbonate. Also included were a few areas of the St. Paul soils.

The plow layer of this Carey soil is easily worked, but if it is tilled excessively, it is pulverized and is more likely to blow. Water passes through the soil at a moderate rate, and the available water capacity is high. Water erosion is a hazard. Also, a plowpan forms if the soil is tilled continuously to the same depth.

Under good management this soil is moderately to highly productive, and nearly all of it is cultivated. The main crops are small grain, cotton, and grain sorghum, but forage sorghum and alfalfa and other legumes also do well in years of normal rainfall. This soil is suitable for irrigation. (Capability unit IIe-1; Loamy Prairie range site; Windbreak group 4)

Cottonwood Series

The Cottonwood series consists of very shallow, dark-colored soils of the uplands. These soils formed under short and mid grasses in material weathered from beds of crystalline gypsum. They occur south of Reed and in the northwestern part of the county.

The Cottonwood soils have a surface layer of brown, friable, calcareous loam about 6 inches thick. This layer is granular in structure.

The underlying material is soft, white gypsum that contains calcium carbonate. The gypsum occurs in beds 3 to several feet thick and is more consolidated with depth.

The Cottonwood soils are well drained; they have rapid runoff and medium internal drainage. Their available water capacity is low. They are not suitable for cultivation. In most places the soils are covered by only a sparse growth of native grasses and forbs, but many areas are bare.

In this county the Cottonwood soils are mapped only in a complex with the Acme soils.

Cottonwood-Acme complex (Cw) (0 to 5 percent slopes).—This complex consists of Cottonwood soils, Acme soils, and outcrops of gypsum, all so closely intermingled that it is impractical to show them separately on a map. From 50 to 70 percent of the complex is Cottonwood soils, 15 to 45 percent is Acme soils, and 10 to 20 percent is gypsum outcrops. The soils occupy gently sloping uplands. Of the two largest areas, one is south of Reed and the other is in the northwestern part of the county.

The Cottonwood soils in this complex have a profile similar to the typical profile of the Cottonwood series. In the Acme soils the profile is similar, in most respects, to the one that is typical, but these Acme soils have a reddish-brown subsoil. The gypsum that crops out is impure and contains calcium carbonate. In some places it is covered with soil material as much as 4 inches thick.

Included in mapping were a few areas of the Tarrant, Vernon, and Weymouth soils. The Tarrant soils are very shallow over dolomitic limestone. The Vernon soils are shallow or very shallow over beds of red clay of Permian age. The Weymouth soils are moderately deep, are highly calcareous, and overlie clayey red beds.

The soils in this complex are not suited to cultivated crops. Nearly all of the acreage is used for pasture. Yields of forage are limited under even the best management. (Capability unit VIIs-2; Cottonwood soil, Gyp range site; Acme soil, Loamy Prairie range site; Windbreak group 5)

Enterprise Series

The Enterprise series consists of deep, dark-colored soils that formed in calcareous eolian or alluvial material under tall and mid grasses. These soils occur on nearly level to strongly sloping terraces adjacent to the North, Elm, and Salt Forks of the Red River. They are 20 to 100 feet above the river channels.

The Enterprise soils have a surface layer of dark-brown, friable very fine sandy loam about 18 inches thick. This layer is calcareous, granular in structure, and easily tilled.

The subsoil is about 12 inches thick. It is very fine sandy loam and is much like the surface layer but is slightly lighter colored and has prismatic structure.

The underlying material is calcareous very fine sandy loam that generally is yellowish red.

These soils are well drained. They take in water readily but have low to moderate available water capacity. Their internal drainage is medium or rapid, and their permeability is moderate.

The Enterprise soils are fertile, productive, and easily tilled. The ones on steeper slopes are less productive than those on milder slopes. The main problems in managing these soils are controlling water and wind erosion and maintaining soil structure and fertility. Cotton, small grain, sorghum, and alfalfa are the principal crops. The nearly level to sloping areas are suitable for irrigation.

Enterprise very fine sandy loam, 0 to 1 percent slopes (EnA).—This well-drained soil occupies terraces. Generally, it is about 20 feet above the river beds, but some areas are as much as 100 feet above them. Included in mapping were a few areas of the Tipton and Miles soils, which are made up of more layers than this soil and have a more clayey subsoil.

Under good management this soil is highly productive. In managing it, the main problem is maintaining structure.

The plow layer is easily worked, but if it is tilled excessively, it is pulverized and blows easily. Water passes through the soil at a moderate rate; the available moisture capacity is moderate. Runoff is slow.

This soil is nearly all cultivated. It is well suited to small grain. Yields of cotton, sorghum, and legumes are uncertain in years when rainfall is below normal. Some of the acreage is irrigated. (Capability unit IIc-1; Loamy Prairie range site; Windbreak group 2)

Enterprise very fine sandy loam, 1 to 3 percent slopes (EnB).—This soil occurs in gently sloping areas on old terraces. In places it is adjacent either to Yahola fine sandy loam or to Sandy alluvial land, which are on the flood plains.

Except that its surface layer is about 15 inches thick, this soil is similar to Enterprise very fine sandy loam, 0 to 1 percent slopes. Included in mapping were a few areas of the Tipton and Miles soils, which consist of more layers than this soil and have a more clayey subsoil.

This soil is moderately to highly productive if it is well managed. The main problems are controlling water erosion and maintaining soil structure and fertility. Water passes through the soil at a moderate rate, and a moderate amount is lost through runoff. The available water capacity is moderate.

Nearly all of this soil is used for cultivated crops, commonly small grain, cotton, and grain sorghum. Forage sorghum and alfalfa and other legumes do well in years of normal rainfall. The soil is suitable for irrigation. (Capability unit IIe-1; Loamy Prairie range site; Windbreak group 2)

Enterprise very fine sandy loam, 3 to 5 percent slopes (EnC).—The surface layer of this soil is only about 12 inches thick because part of it has been removed by erosion. The subsoil is more reddish than typical. Included in mapping were a few areas of the Miles soils, which have more layers and a more clayey subsoil than this soil; a few areas in which much of the original surface layer has been lost through water erosion; and a few areas that have a surface layer of fine sandy loam.

This soil is moderately productive if it is well managed. Although water passes through the soil at a moderate rate, a large amount of rainfall is lost through runoff, and measures are needed to control washing and to maintain soil structure and fertility. The available water capacity is moderate.

About three-fourths of this soil is used for cultivated crops, mainly small grain, cotton, and sorghum. The rest is used for pasture. Sweetclover and other legumes do well in years of normal rainfall. The soil is suitable for sprinkler irrigation. (Capability unit IIIe-2; Loamy Prairie range site; Windbreak group 4)

Enterprise very fine sandy loam, 5 to 8 percent slopes (EnD).—This soil is on strongly sloping breaks between bottom lands and old, high terraces. The areas range from 10 to 60 acres in size, and some are long and narrow. The surface layer is about 10 inches thick, and the subsoil is more reddish than is typical for Enterprise soils.

Included in the areas mapped are a few areas of the Lawton, Woodward, and Weymouth soils. Also included are a few areas that have lost much of the original surface layer through erosion and a few areas that have a surface layer of fine sandy loam.

This soil is well suited to native grasses, but it can be cultivated if it is well managed. Among the crops grown are small grain, cotton, sorghum, sweetclover, and grasses for temporary pasture. Runoff is greater on this soil than on Enterprise very fine sandy loam, 3 to 5 percent slopes, and controlling water erosion, as well as controlling wind erosion, is a problem. Water passes through the soil at a moderate rate; the available water capacity is moderate.

About three-fourths of this soil is in native pasture. The rest is used for cultivated crops. The soil is not suitable for irrigation. (Capability unit IVe-5; Loamy Prairie range site; Windbreak group 5)

Eroded Sandy Land

Eroded sandy land (Er) consists of deep, sandy soil material that has been severely eroded by wind or water. This land type occurs on gently sloping to strongly sloping uplands throughout the county. It is cut by V-shaped side gullies that are 3 to 10 feet deep and 50 to 200 feet apart and that generally join the drainageways at a right angle. In addition, there are a few areas that have been severely eroded by wind and are marked by blowouts 10 acres or more in size. Between the gullies and the blowouts are remnants of the original soils. These soils were mainly in the Brownfield, Miles, Nobscot, Springer, and Tivoli series.

Eroded sandy land has rapid runoff and receives a large amount of water from higher surrounding areas. Consequently, the hazard of further erosion is severe if the surface is left bare. Water passes through the soil material at a moderate to rapid rate.

This land type is not suited to cultivated crops. It is well suited to perennial grasses used for grazing. Some areas have been seeded to native grasses and, under good management, produce low to moderate yields of forage. (Capability unit VIe-2; Eroded Sandy Land range site; Windbreak group 5.)

Hollister Series

The Hollister series consists of deep, dark-colored soils that formed under short and mid grasses in old alluvium or in calcareous material of the clayey red beds. These soils occur on broad, nearly level uplands and are mainly in two areas, one south of Mangum and one near Jester.

The surface layer, about 8 inches thick, is dark grayish-brown, noncalcareous clay loam that is neutral or mildly alkaline in reaction. It has granular structure and is easily tilled.

The subsoil has blocky structure (fig. 7) and is about 34 inches thick. The upper part of this layer is dark grayish-brown, noncalcareous silty clay loam that is mildly alkaline in reaction. The lower part is dark-brown or brown, very firm, calcareous silty clay or silty clay loam. The average depth to the calcareous material is 22 inches.

The underlying material is dark-gray, firm, calcareous clay loam.

The Hollister soils are well drained. They take in water slowly and have high available water capacity. Runoff, internal drainage, and permeability are slow.

These soils are fertile and productive, but practices are needed that maintain soil structure and conserve the limited rainfall. Small grain is the best suited crop, but cotton, sorghum, and alfalfa also are grown. The soils are suitable for irrigation.

Figure 7.—**Profile of Hollister clay loam, 0 to 1 percent slopes, that shows the blocky subsoil.**

Hollister clay loam, 0 to 1 percent slopes (HcA).—This is the only Hollister soil mapped in Greer County. It is a well-drained, nearly level soil on uplands. In some places a concentration of salts makes the soil lighter colored than the surrounding areas, and a whitish crust tends to form on the surface after rains and between cultivations.

Included with this soil in mapping were a few areas of the Tillman soils, which have a more reddish and less permeable subsoil than this Hollister clay loam. Some ponded depressions that generally are less than 10 acres in size were also included.

The plow layer of this Hollister soil is easily worked, but excessive tillage pulverizes the surface soil and makes it susceptible to blowing. In addition, the soil shrinks when dry and swells when wet. Water passes through the soil at a slow rate. The available water capacity is high.

Nearly all of this highly fertile soil is used for cultivated crops. Small grain does best. Cotton, sorghum, and legumes are uncertain crops in years of below-normal rainfall. This soil is suitable for irrigation. (Capability unit IIc-1; Hardland range site; Windbreak group 4)

La Casa Series

The La Casa series consists of deep, dark-colored, gently sloping soils on uplands in the western part of the county. These soils formed under short and mid grasses in material derived from clayey Permian red beds that contained layers of dolomitic limestone and were high in content of calcium carbonate (fig. 8).

The surface layer is dark-brown, mildly alkaline clay loam about 11 inches thick. It has granular structure and is friable when moist.

The subsoil, about 20 inches thick, is reddish-brown clay loam of blocky structure. It is moderately alkaline in reaction. Calcium carbonate occurs only in the lower part of this layer.

The underlying material is reddish-brown clay loam that contains a large amount of calcium carbonate and, in most places, includes thin layers of grayish dolomitic limestone.

The La Casa soils are well drained. Internal drainage is slow, runoff is medium, and permeability is moderately slow. The available water capacity is high. Water erosion is the most serious hazard in tilled areas.

La Casa clay loam, 1 to 3 percent slopes (LaB).—This is the only La Casa soil mapped separately in the county. It is well drained and is on gently sloping uplands.

Figure 8.—**Profile of La Casa clay loam, 1 to 3 percent slopes, that shows the depth to which the calcium carbonate has been leached.**

Included with this soil in mapping were a few areas of the Tillman soils, which are more clayey and less permeable than this soil; of the Weymouth soils, which have less distinct layers and are shallower; of the Vernon soils, which are very shallow to the underlying clayey red beds; and of the Tarrant soils, which are very shallow to dolomitic limestone. Also included were a few nearly level areas and, in a few places, outcrops of domolitic limestone.

This soil is easily worked. It loses a moderate amount of water through runoff, and water passes through it at a moderately slow rate. Its available water capacity is high.

This moderately to highly fertile soil is nearly all in small grain, cotton, and grain sorghum. Because it is droughty, it is best suited to small grain, but alfalfa and other legumes and forage sorghum do well in years of above-normal rainfall. The soil is suitable for irrigation. (Capability unit IIe-1; Hardland range site; Windbreak group 4)

Lawton Series

The Lawton series consists of deep, dark-colored, nearly level to sloping soils on uplands. These soils formed under tall and mid grasses in old granitic outwash material. Most of their acreage is on the foot slopes of the Wichita Mountains in the eastern part of the county, but some is near Mangum and Reed.

The surface layer is dark-brown, noncalcareous loam about 9 inches thick. It has granular structure, is easily tilled, and is neutral or slightly acid in reaction.

The subsoil, about 36 inches thick, is dark-brown clay loam in the upper part and reddish-brown clay loam in the lower part. This layer has blocky structure, is free of calcium carbonate, and is neutral in reaction.

The underlying material is yellowish-red gravelly clay loam that contains a few spots of calcium carbonate and is mildly alkaline in reaction.

The Lawton soils are well drained. Internal drainage is medium, and permeability is moderately slow. The rate of water intake is good, and the available water capacity is high. The main problems in tilled areas are controlling water erosion and conserving moisture.

Lawton loam, 0 to 1 percent slopes (LtA).—This well-drained, nearly level soil is on uplands, mainly near Granite, Mangum, and Reed. In a few places coarse granitic pebbles, 2 to 3 inches in diameter, occur on the surface.

Included with this soil in mapping were a few areas of the Hollister and the Miles soils. The Hollister soils have a more clayey subsoil than this Lawton soil, and the Miles soils have a more sandy surface layer and subsoil.

If this soil is well managed, it is highly productive. Runoff is slow, and water infiltrates at a moderately slow rate. The available water capacity is high. The main need is to maintain the soil structure.

Nearly all of this soil is used for cultivated crops. Small grain is well suited, but cotton, sorghum, and legumes also are grown. Some of the acreage is irrigated. (Capability unit IIc-1; Loamy Prairie range site; Windbreak group 4)

Lawton loam, 1 to 3 percent slopes (LtB).—This gently sloping soil adjoins areas of Lawton loam, 0 to 1 percent slopes. Its surface layer is about 8 inches thick. On the surface, in places, are some coarse granitic pebbles that range from 2 to 3 inches in diameter.

Included in mapping were scattered areas of the Miles soils, which are more sandy in the surface layer and subsoil than this Lawton soil.

This soil is easily tilled and is highly productive under management that controls water erosion and maintains fertility and soil structure. A moderate amount of moisture is lost through runoff. Water moves through the soil at a moderately slow rate. The available water capacity is high.

Nearly all of this soil is cultivated. Small grain is the best suited crop, though cotton, sorghum, and legumes also are grown. The soil is suitable for irrigation. (Capability unit IIe-1; Loamy Prairie range site; Windbreak group 4)

Lawton loam, 3 to 5 percent slopes, eroded (LtC2).—This soil occurs in sloping areas adjacent to areas of Lawton gravelly complex, 3 to 8 percent slopes, and is mainly north of Granite. It has lost part of its original surface layer through sheet erosion, and the present surface layer, about 5 inches thick, is thinner than is typical for the Lawton series.

The surface layer is brown in most areas. It is reddish brown, however, in areas that have been cultivated, because part of the underlying subsoil has been mixed with the original surface layer. In most places the subsoil is about 25 inches thick and contains more granitic pebbles than the subsoil of typical Lawton soils. The pebbles make up about 10 percent of the subsoil.

Included in the areas mapped are a few areas of a gravelly soil that is shallow to beds of granitic gravel.

Because this soil loses a large amount of water through runoff, intensive practices are needed to reduce runoff and to provide protection against further erosion. Additional problems are maintaining soil structure and fertility. Water moves through this soil at a moderate to moderately slow rate; the available water capacity is moderate to high.

About 80 percent of this soil is used for wheat, cotton, sorghum, and other cultivated crops. The acreage is well suited to pasture, but yields of cultivated crops are moderate if the soil is well managed. Irrigation is not suitable. (Capability unit IVe-4; Loamy Prairie range site; Windbreak group 5)

Lawton gravelly complex, 3 to 8 percent slopes (LvD).—This complex consists of a Lawton soil and a gravelly soil that are so intermingled that it is not practical to separate them on a map. The Lawton soil makes up 50 to 80 percent of the complex, and the gravelly soil makes up 20 to 50 percent.

The Lawton soil has a surface layer of brown or dark-brown gravelly loam that is slightly acid and ranges from 4 to 6 inches in thickness. The subsoil is brown or reddish-brown gravelly clay loam, 20 to 25 inches thick, that is slightly acid. The material underlying the subsoil is yellowish-red or red gravelly clay loam. From 5 to 30 percent of this layer consists of granitic pebbles.

The gravelly part of this complex varies in characteristics. Its surface layer, 10 to 20 inches thick, is brown or reddish-brown, slightly acid gravelly loam. Granitic pebbles make up 5 to 20 percent of the layer. Below the surface layer is a layer of reddish-brown or yellowish-red gravelly loam that is 10 to 40 inches thick and con-

tains granitic pebbles. The pebbles make up 10 to 60 percent of the mass. Beds of granitic gravel or of consolidated granite lie within 20 to 60 inches of the surface.

Included in the areas mapped as this complex are a few areas of the Lawton soils that have been cultivated and have been severely eroded by water. Also included are a few areas of the Enterprise soils near Lake Altus.

This Lawton gravelly complex has rapid runoff and is suited only to permanent grass. Nearly all the acreage is in pasture that, if well managed, yields a moderate amount of forage. (Capability unit VIe–3; Loamy Prairie range site; Windbreak group 5)

Mangum Series

In the Mangum series are deep, brownish, nearly level soils on bottom lands. These soils are flooded occasionally and have slow runoff. The Mangum soils in this county formed under mid and tall grasses in clayey alluvium. They occur mainly along Haystack Creek but also as small areas on the bottom lands of the other streams.

The surface layer, about 8 inches thick, is brown clay that contains calcium carbonate. It has blocky structure, is moderately alkaline, and is tight and plastic.

The subsoil is reddish-brown clay about 25 inches thick. It is tough, compact, and very hard when dry. This layer is massive, or structureless, and contains calcium carbonate.

The underlying material is reddish-brown clay loam that also is massive and contains calcium carbonate.

The Mangum soils are moderately well drained. Although their available water capacity is high, they are droughty and hold only a small amount of water available to plants because they are very slowly permeable. Runoff is slow, and internal drainage is very slow. Natural fertility is moderate.

Mangum clay (Ma) (0 to 1 percent slopes).—This is the only Mangum soil mapped in this county. It occupies nearly level bottom lands and is moderately well drained. In some places this soil has a concentration of salts. In these areas it is lighter colored than the surrounding soils, and a whitish crust tends to form on the surface after rains.

Included in mapping were scattered areas of Spur clay loam and of the Treadway soils. The Treadway soils are less fertile than the Mangum soil and have less distinct layers.

This Mangum soil is droughty and is moderate in fertility. It is very slowly permeable to air, water, and roots. When it is dry, it forms large cracks, and when it is wet, it is sticky and plastic. Flooding occasionally damages cultivated crops. The main management problems are maintaining structure, increasing water intake, and reducing surface crusting.

Nearly all of this soil is used for grazing and is in native range. Some areas are used for cultivated crops. Small grain is the crop best suited. This soil is not suitable for irrigation. (Capability unit IIIs–1; Heavy Bottom Land range site; Windbreak group 5)

Mansic Series

The Mansic series consists of moderately deep, dark-colored, nearly level soils of the uplands. These soils formed under tall and mid grasses in calcareous old alluvium. They are inextensive and occur in the vicinity of Lake Creek.

The surface layer, about 13 inches thick, is dark grayish-brown clay loam that is mildly alkaline. It has granular structure.

The subsoil, about 10 inches thick, is gray clay loam. Like the surface layer, it contains calcium carbonate and has granular structure.

The upper part of the underlying material is light-gray clay loam in which carbonates have accumulated. This layer has granular structure and is about 14 inches thick. The lower part is yellowish-red clay loam that extends to a depth of 80 inches or more. It contains a slightly smaller amount of accumulated carbonates than the upper part.

The Mansic soils are well drained. Runoff is slow, internal drainage is medium, and permeability is moderate. The water intake rate is good, and the available water capacity is moderate to high.

Mansic clay loam, 0 to 1 percent slopes (McA).—This is the only soil of the Mansic series that is mapped in the county. It is a well-drained soil on nearly level uplands.

Included in mapping were a few areas of Abilene clay loam, which is more clayey than this soil and has more distinct layers, and areas of Miles fine sandy loam, which is more sandy and has a more reddish subsoil.

If this Mansic soil is well managed, good yields of suitable crops and grasses can be expected. The plow layer is easily worked, but if it is tilled excessively it is pulverized and blows more easily. Water passes through this soil at a moderate rate. The available water capacity is moderate to high.

Nearly all of this soil is used for cultivated crops. Small grain is best suited, but cotton, sorghum, and legumes also are grown. The soil is suitable for irrigation. (Capability unit IIc–1; Loamy Prairie range site; Windbreak group 4)

Meno Series

The Meno series consists of deep, moderately well drained soils that occupy nearly level areas on uplands. These soils formed under tall grasses in old alluvium that contained a large amount of sand. They occur mainly southeast of Mangum.

The surface layer, about 18 inches thick, is brown loamy fine sand that is free of calcium carbonate and is slightly acid. It is granular in structure and is easily worked.

The subsoil is sandy clay loam about 21 inches thick. It is reddish brown in color but is mottled with yellowish red and gray in the lower part. It is slightly acid or neutral in reaction.

The underlying material is clay loam that is dark brown or gray and is mottled with yellowish red and reddish brown. It is neutral or mildly alkaline in reaction.

The Meno soils are moderately well drained. Runoff is slow, and internal drainage and permeability are moderately slow. The available water capacity is moderate to high. These soils have moderate to low fertility, and they are susceptible to wind erosion. In years of normal

or above-normal rainfall, they respond well to commercial fertilizer.

In this county the Meno soils are mapped only with the Altus soils.

Meno and Altus loamy fine sands (Me) (0 to 1 percent slopes).—These well drained and moderately well drained soils occupy nearly level areas of the upland. In some places they have a concentration of salts. In these places the surface soil is lighter colored than that of the surrounding soils, and a whitish crust tends to form on the surface after rains and between cultivations.

Included in mapping were a few areas of Miles loamy sand, Brownfield loamy fine sand, or Springer loamy fine sand.

The fertility of Meno and Altus loamy fine sands is low to medium, but crops respond well to fertilizer if it is applied in amounts determined by soil tests. The plow layer is easily tilled. Permeability is moderate or moderately slow, and the available water capacity is moderate to high. Little water is lost through runoff. In wet periods the water table is within 40 to 50 inches of the surface.

Nearly all the acreage of these soils is used for cultivated crops, and a large part has been deep plowed to a depth of as much as 25 inches. The main management problems are controlling water erosion and wind erosion and maintaining fertility. Cotton and sorghum are the main crops, but some small grain and legumes also are grown. Yields are moderate if these soils are well managed. Sprinkler irrigation is suitable. (Capability unit IIIe-4; Deep Sand range site; Windbreak group 1)

Miles Series

The Miles series consists of deep soils that formed under tall and mid grasses in old alluvium that contained a large amount of sand. These soils occur throughout the county on nearly level or gently sloping uplands.

The surface layer, about 14 inches thick, is brown fine sandy loam that is free of calcium carbonate and is neutral in reaction. It has granular structure and is easily worked.

The subsoil, about 41 inches thick, is sandy clay loam. This layer is free of calcium carbonate, is neutral in reaction, and has prismatic structure. It is reddish brown in the upper part and yellowish red in the lower part.

The underlying material is yellowish-red sandy loam that is easily penetrated by plant roots. It is moderately alkaline.

The Miles soils are naturally well drained. Internal drainage is medium, and permeability is moderate. The available water capacity is moderate. The fertility is moderate to low, but in years of normal or above-normal rainfall, crops respond well to commercial fertilizer. Cultivated areas, however, are susceptible to wind erosion and water erosion.

Miles fine sandy loam, 3 to 5 percent slopes (MfC).—The surface layer of this soil is about 9 inches thick.

Included in mapping were areas of 5 acres or less from which most of the surface layer has been removed through erosion. Also included were scattered areas, less than 5 acres in size, of Enterprise very fine sandy loam.

This Miles soil is easily tilled and, if well managed, has low to moderate productivity. Crops respond to fertilizer if it is applied in amounts indicated by soil tests. Water passes through this soil at a moderate rate. A large amount of water is lost through runoff. The main problems of management are controlling water erosion and wind erosion and maintaining soil fertility.

Nearly all of this soil is used for cultivated crops. The main crops are cotton, sorghum, and wheat, but sweetclover, rye, and cowpeas also are grown. This soil is suitable for sprinkler irrigation. (Capability unit IIIe-3; Sandy Prairie range site; Windbreak group 4)

Miles fine sandy loam, 3 to 5 percent slopes, eroded (MfC2).—This soil has lost most of its original surface layer through erosion. Its present surface layer is about 4 inches thick. It is reddish brown in areas that have been cultivated, because part of the underlying subsoil has been mixed with original surface material. Where rills and shallow gullies have been plowed and smoothed, erosion is evident only in the color of the surface layer.

Included in mapping were a few areas, less than 5 acres in size, of Enterprise very fine sandy loam.

This Miles soil is easily tilled. The fertility is low, but crops respond well to fertilizer if it is applied in amounts determined by soil tests. Water passes through this soil at a moderate rate. A large amount is lost through runoff, and intensive practices are needed that reduce runoff and protect the soil from further erosion. Practices that control wind erosion and maintain fertility are also needed.

All of this soil was once cultivated, but many areas are no longer used for crops, because erosion has thinned the surface layer in most places and has lowered fertility. Nevertheless, if management is intensive, all the acreage is suited to cultivated crops. Cotton, sorghum, and small grain are the main crops. Yields generally are low. Some areas have been seeded to native grasses. This soil is not suited to irrigation. (Capability unit IVe-6; Sandy Prairie range site; Windbreak group 4)

Miles and Altus fine sandy loams, 0 to 1 percent slopes (MuA).—These well-drained soils occur on uplands. The surface layer of the Miles soil in this undifferentiated group is about 16 inches thick, but in other respects, the profile is similar to that of the typical Miles soils (fig. 9). The profile of the Altus soil is typical of the Altus series.

Included in mapping were a few areas where the plow layer has been eroded by wind and is sandy loam.

The plow layer is easily tilled and can be worked throughout a wide range of moisture content without clodding or crusting. Water passes through these soils at a moderate rate, and only a small amount is lost through runoff. The available water capacity is moderate. If the soils are well managed, productivity is moderate. Crops respond to fertilizer if it is applied in amounts determined by soil tests. The principal problems in managing these soils are controlling wind erosion and water erosion and maintaining fertility and soil structure.

Nearly all the acreage of these soils is used for cultivated crops. The main crops are cotton, grain sorghum, and wheat. Other crops grown are alfalfa, sweetclover, cowpeas, guar, vetch, and rye. These soils are suitable for irrigation. (Capability unit IIe-2; Sandy Prairie range site; Windbreak group 1)

Miles and Altus fine sandy loams, 1 to 3 percent slopes (MuB).—The profile of the Miles soil in this undifferentiated group is typical of the Miles series, and that of the Altus soil is typical of the Altus series.

Figure 9.—**Profile of a Miles fine sandy loam that shows prismatic structure.**

Included in mapping were some areas, less than 5 acres in size, of Miles fine sandy loam, 3 to 5 percent slopes. Also included were a few areas that have been eroded by wind and have a sandy loam plow layer and areas of 5 acres or less that have lost most of the surface layer through erosion.

The plow layer of these Miles and Altus soils is easily tilled. Water passes through the soils at a moderate rate; a moderate amount is lost through runoff. The available water capacity is moderate. If the soils are well managed, they are moderately productive. Crops respond to fertilizer if it is applied in amounts determined by soil tests. The major problems are controlling wind erosion and water erosion and maintaining fertility.

Nearly all the acreage of these soils is used for cultivated crops. Cotton, sorghum, and wheat are the main crops, but a legume such as sweetclover also does well. These soils are suitable for irrigation. (Capability unit IIIe-3; Sandy Prairie range site; Windbreak group 1)

Miles and Brownfield soils, 0 to 3 percent slopes (MwB).—These soils are on uplands. The Miles soil has a surface layer of brown loamy fine sand 12 to 25 inches thick. In other respects its profile is similar to the one that is typical of the series. The Brownfield soil has a profile similar to the one that is typical of the Brownfield series.

Included in mapping were scattered areas of Springer loamy fine sand, Meno loamy fine sand, or Nobscot fine sand. Also included, northwest of Russell, were some small areas of Miles loamy sand and Brownfield fine sand on slopes of 1 to 5 percent. In these areas most of the surface layer has been removed by erosion.

These soils have low fertility, but crops respond well to fertilizer if it is applied in amounts determined by soil tests. They lose only a small amount of water through runoff. Management consists mainly of controlling wind erosion and water erosion and maintaining soil fertility.

Nearly all the acreage is used for cultivated crops and has been deep plowed to a depth of as much as 25 inches. Cotton and sorghum are the main crops, but some small grain and legumes also are grown. Yields are moderate if these soils are well managed. Sprinkler irrigation is suitable. (Capability unit IIIe-4; Miles soil, Deep Sand range site; Brownfield soil, Deep Sand Savannah range site; Windbreak group 1)

Nobscot Series

This series consists of deep, light-colored soils that formed under shinnery oak and tall grasses in old alluvium that has been reworked by wind. These soils occur on choppy-surfaced uplands that are nearly level to moderately steep. They occupy three main areas; one is northwest of Russell, one is northeast of Willow, and one is in the southeastern corner of the county.

To a depth of 4 inches, the surface layer is grayish-brown, loose fine sand. Underlying this material is about 15 inches of pale-brown, loose fine sand. These layers are medium acid or slightly acid in reaction.

The subsoil, about 22 inches thick, is yellowish-red, slightly acid sandy loam. In places it contains reddish-brown layers that are about one-fourth inch thick.

Below the subsoil is reddish-yellow, neutral loamy fine sand that has, in the upper part, layers of reddish-brown, sticky sandy loam about one-eighth inch thick.

The Nobscot soils are well drained. Internal drainage is rapid, and permeability is moderately rapid. The available water capacity is low. The natural fertility of these soils is low; cultivated areas are susceptible to wind erosion.

Nobscot fine sand, 0 to 5 percent slopes (NoC).—This well-drained soil is on uplands.

Included in mapping were a few areas of Brownfield loamy fine sand, Miles loamy fine sand, Springer loamy fine sand, or Tivoli loamy fine sand. Also included were a few areas from which most of the surface layer has been removed by erosion. These inclusions generally are 5 acres or less in size.

The fertility of this soil is low, but crops respond well to fertilizer if it is applied in amounts indicated by soil tests. Water passes through the soil at a moderately rapid rate. The available water capacity is low. The main problems are controlling wind erosion and maintaining soil fertility.

About 60 percent of this soil is used for cultivated crops, and the rest is used for grazing. The main crops are

cotton, sorghum, and some small grain. This soil is probably best suited to native grasses. It is not suitable for irrigation. (Capability unit IVe-7; Deep Sand Savannah range site; Windbreak group 4)

Nobscot fine sand, 5 to 12 percent slopes (NoD).—This soil occurs on uplands and, in most places, is adjacent to Nobscot fine sand, 0 to 5 percent slopes. The surface layer is about 25 inches thick, but the rest of the profile is similar to the one that is typical of the Nobscot series.

Included in mapping were scattered areas of Tivoli fine sand or Springer loamy fine sand and a few areas from which most of the surface layer has been removed by erosion. These inclusions generally are 5 acres or less in size.

Water passes through the soil at a moderately rapid rate, and the available water capacity is low. Fertility also is low.

This soil is not suitable for cultivation. Nearly all the acreage is used for grazing and is in native range consisting of shinnery oak and tall grasses. If woody plants are controlled and the native grasses are well managed, the grasses generally improve and yield a moderate amount of forage. (Capability unit VIe-4; Deep Sand Savannah range site; Windbreak group 4)

Quinlan Series

In the Quinlan series are shallow, reddish soils that formed under mid and tall grasses in weakly consolidated, calcareous sandstone. These soils occur on gently sloping to moderately steep uplands, mainly in the northwestern part of the county.

The surface layer of reddish-brown loam is about 8 inches thick. It has granular structure, contains calcium carbonate, and is easily penetrated by roots.

The upper part of the underlying material is red, loamy, slightly weathered sandstone or packsand that contains calcium carbonate. The lower part is red, weakly compacted packsand or sandstone that contains gray specks. This sandstone ranges from soft to hard. In many places, calcium carbonate has accumulated along natural cracks in the underlying material.

The Quinlan soils are well drained. Internal drainage is medium, and permeability is moderate. The available water capacity is low. The fertility is low, but yields of forage are moderate if management is good.

Quinlan loam, 8 to 20 percent slopes (QaF).—This soil occurs on sloping to moderately steep uplands or in entrenched, V-shaped drainageways and is shallow to bedrock. Its profile is similar to that of typical Quinlan soils.

Included in mapping were scattered areas of Woodward loam and Vernon soils and outcrops of bare sandstone. These inclusions generally are 10 acres or less in size.

Water passes through this soil at a moderate rate, and a large amount is lost through runoff. The available water capacity is low. The soil is subject to severe water erosion unless native grasses are well managed. Yields of forage are low to moderate.

This soil is used for pasture or range. It is not suitable for cultivation. If the range is in excellent condition, mid and tall grasses make up most of the native forage. Range that is in fair or poor condition benefits from deferred grazing. Seeding grazed-out areas to suitable grasses helps to control erosion and to improve yields. (Capability unit VIe-5; Shallow Prairie range site; Windbreak group 5)

Quinlan-Woodward loams, 3 to 5 percent slopes, eroded (QwC2).—This complex consists of areas of Quinlan loam and Woodward loam that are so closely intermingled that it is impractical to show them separately on the map. These soils occur on sloping drainageways within areas of less sloping soils, mainly in the northern half of the county. They have lost part of their original surface layer through sheet erosion.

The Quinlan soils make up 45 to 75 percent of this complex. Their surface layer, about 5 inches thick, is thinner than that of Quinlan loam, 8 to 20 percent slopes. In most places the surface layer is reddish brown or red. It is red in areas that have been cultivated, because part of the underlying material has been mixed with the original surface layer. In some areas that have been cultivated, the red and gray parent rock is exposed.

The Woodward soils make up 15 to 45 percent of this complex. Their surface layer, about 5 inches thick, is thinner than that of Woodward loam, 3 to 5 percent slopes.

Included in the areas mapped as this complex is a soil that has a few characteristics of Weymouth clay loam and a few characteristics of Woodward loam. This included soil generally makes up 10 percent of the complex, but it makes up 60 percent in a few small areas east of Brinkman. The surface layer is loam in texture, brown or reddish brown in color, and about 5 inches thick. The subsoil is reddish-brown loam or clay loam about 12 inches thick. It lacks the layer of calcium carbonate that is characteristic of the Weymouth soils.

Water passes through these soils at a moderate rate. A large amount is lost through runoff. The available water capacity is low to moderate. The main management problems are controlling water erosion and maintaining soil structure and fertility. Growing high-residue crops, constructing field terraces, and farming on the contour help to slow erosion.

All the acreage was once cultivated. In many places the surface layer is eroded and is much thinner than it was originally. Because the surface layer is thin and fertility is low, many areas are no longer used for crops. Some have been seeded to native grasses. Nevertheless, under intensive management all the acreage is suited to cultivated crops. Where rills and shallow gullies have been plowed and smoothed, the only evidence of erosion is in the color of the surface layer. Suitable crops are small grain and some legumes. Yields of cotton and sorghum are low. (Capability unit IVe 4; Quinlan soil, Shallow Prairie range site; Woodward soil, Loamy Prairie range site; Windbreak group 5)

Quinlan-Woodward loams, 5 to 12 percent slopes (QwE).—This complex consists of areas of Quinlan loam and Woodward loam that are so closely intermingled that it is impractical to show them separately on the map. These soils occupy strongly sloping to moderately steep uplands, mainly in the northwestern part of the county.

The Quinlan soils, which make up 50 to 75 percent of this complex, have a profile similar to the one that is typical of the series.

The Woodward soils, which make up 25 to 50 percent, have a profile similar to the one that is typical of the Woodward series.

Included in the areas mapped are scattered areas of Vernon soils and a few small outcrops of gypsum. These areas generally are 10 acres or less in size. Also included are some areas that have been severely eroded by water.

Water passes through these soils at a moderate rate, and a large amount is lost through runoff. The available water capacity is low to moderate. These soils are subject to severe water erosion unless the native grasses are well managed, and yields of forage are low to moderate at best.

These soils are suited to permanent vegetation and are used for pasture or range. They are not suitable for cultivated crops. If the range is in excellent condition, mid and tall grasses make up most of the vegetation. Controlling grazing and seeding grazed-out areas to suitable grasses help to reduce erosion and to improve yields. (Capability unit VIe–6; Quinlan soil, Shallow Prairie range site; Woodward soil, Loamy Prairie range site; Windbreak group 5)

Rock Outcrop

Rock outcrop (Rc) consists of steep, stony areas that are made up mostly of broken rock and small patches of loamy soil material over granite. This land type is in the eastern part of the county where the Wichita Mountains rise from 100 to 500 feet above the surrounding plain. Included in mapping were scattered areas, 10 acres or less in size, of Lawton loam.

Rock outcrop is not suited to cultivated crops and has little value for grazing. Most of its acreage is used as range. Control of grazing is needed. (Capability unit VIIs–4; Granite Hills range site; Windbreak group 5)

Rough Broken Land

Rough broken land (Rk) consists of very shallow, clayey soil material on steep breaks or escarpments in the western part of the county. Little or no soil formation has taken place, and geologic erosion has cut into the underlying beds of red clay and shale of Permian age. The areas generally are 25 acres or more in size. Normally, those of less than 25 acres are mapped with Vernon-Weymouth complex, 10 to 20 percent slopes. Included in mapping were a few areas, 25 acres or less in size, of Vernon soils and Weymouth clay loams.

This land type is not suitable for cultivated crops. It supports only a limited amount of native vegetation and, consequently, is of low value for grazing. Furthermore, the steep escarpments restrict the movement of livestock. Careful management is needed to prevent further erosion. (Capability unit VIIs–5; Breaks range site; Windbreak group 5)

Sandy Alluvial Land

Sandy alluvial land (Sa) consists of sandy areas that are about 2 to 6 feet above the channels of the three rivers that flow through the county. These areas are frequently flooded.

The surface layer of this land type is variable, but in most places it is brown loamy fine sand about 7 inches thick. It is underlain by stratified material, generally pink fine sand, that resembles the recent sediments in streambeds. The reaction is mildly alkaline or moderately alkaline. In a few areas a concentration of salts makes the surface layer lighter colored than that of surrounding areas, and a whitish crust tends to form on the surface after rains. In these areas vegetation is limited to plants that tolerate salt. Normally, the water table is within reach of deep-rooted plants.

Included in the areas mapped as this land type are scattered areas, generally 10 acres or less in size, of the Yahola, Spur, and Tivoli soils.

Sandy alluvial land is not suitable for cultivation. It is suited to native grasses and is used mainly for pasture, which, if well managed, yields an adequate amount of forage. (Capability unit Vw–1; Sandy Bottom Land range site; Windbreak group 5)

Sandy Broken Land

Sandy broken land (Sb) consists of variable sandy and gravelly deposits over clayey red beds of Permian age. This land type occurs in areas of 10 acres or more on strongly sloping to steep, broken drainageways that are adjacent to the rivers in the county (fig. 10). In some places geologic erosion has cut through the deposits and, in the vertical walls of the cuts, has exposed the underlying red beds. Areas less than 10 acres in size normally are mapped with the Vernon soils or with the soils of the Vernon-Weymouth complex.

Included in mapping were small areas of the Miles soils. Also included were a few small areas of moderately steep Enterprise soils. For the most part, these areas adjoin the North Fork of the Red River.

This land type is somewhat excessively drained. Runoff is rapid, internal drainage is rapid or medium, and permeability is rapid or moderately rapid. Fertility is low or moderate. Unless the native grasses are well managed, the acreage is subject to severe water erosion and wind erosion.

Because it is steep, Sandy broken land is not suitable for cultivation. Under good management, however, it produces moderate yields of forage. (Capability unit VIe–1; Sandy Prairie range site; Windbreak group 5)

Springer Series

In the Springer series are deep, reddish soils that formed under tall grasses in old alluvium modified by wind. These soils occur on nearly level to strongly slop-

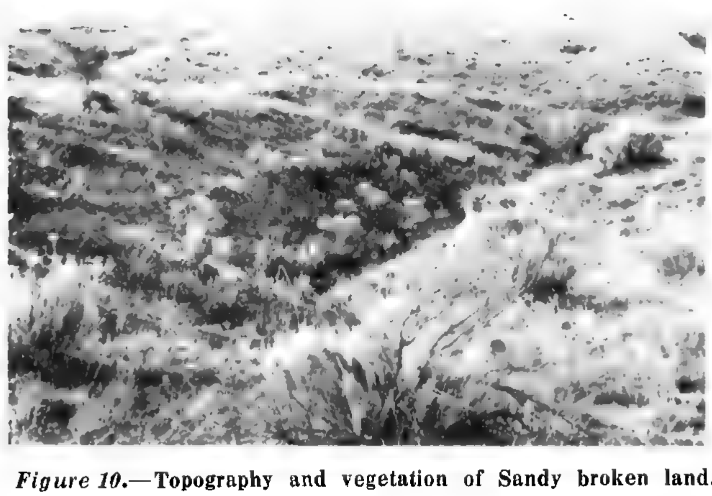

Figure 10.—**Topography and vegetation of Sandy broken land.**

ing uplands throughout the sandy areas of the county.

The surface layer, about 19 inches thick, is brown loamy fine sand that is neutral in reaction. It has granular structure, is very porous, and absorbs water readily.

The subsoil, about 14 inches thick, is reddish-brown sandy loam that is neutral in reaction and has prismatic structure. This layer is moderate to low in available water capacity. It is easily penetrated by roots.

The underlying material is reddish-yellow, neutral loamy sand.

The Springer soils are well drained. They have rapid internal drainage, moderately rapid permeability, and moderate to low available water capacity. Their fertility is low.

Controlling wind erosion is the main management problem. Field windbreaks have been grown successfully, and they provide some protection.

Springer loamy fine sand, 0 to 3 percent slopes (SgB).—This well-drained soil occurs on nearly level or gently sloping uplands, generally near Springer loamy fine sand, 3 to 8 percent slopes. Most of it has been deep plowed to a depth of as much as 25 inches. Where it has been deep plowed, the surface layer is reddish brown because part of the underlying subsoil has been mixed with the original surface layer.

Included in mapping were scattered areas of Miles loamy sand, Brownfield loamy fine sand, and Meno loamy fine sand. These areas generally are 5 acres or less in size.

If it is cultivated, this Springer soil is subject to severe wind erosion. Maintaining soil fertility and controlling water erosion are problems. Careful management of crop residues, the use of stubble-mulch tillage, and the planting of cover crops help to control erosion and maintain fertility.

Water moves through this soil at a moderately rapid rate, and the available water capacity is moderate to low. The fertility is low. Crops respond to fertilizer in amounts determined by soil tests.

Nearly all of this soil is used for cultivated crops. Cotton and sorghum are the main crops, but some small grain and legumes also are grown. Yields are moderate. This soil is suitable for sprinkler irrigation. (Capability unit IIIe-4; Deep Sand range site; Windbreak group 1)

Springer loamy fine sand, 3 to 8 percent slopes (SgD).—This soil occurs on uplands. Its surface layer is about 11 inches thick, and its subsoil is about 12 inches thick.

Included in mapping were scattered areas of Meno loamy fine sand, Nobscot fine sand, Miles loamy fine sand, and Tivoli loamy fine sand. These areas generally are 5 acres or less in size.

Most of this Springer soil has been deep plowed to a depth of as much as 25 inches. In some areas the surface layer is reddish brown because part of the underlying subsoil has been mixed with the original surface layer.

This soil is easily worked but is subject to severe wind erosion. Water moves through the soil at a moderately rapid rate, and a moderate amount is lost through runoff. The available water capacity is moderate to low. The fertility is low, and yields usually are low. Stubble-mulch tillage, cover crops, and careful management of crop residues are among the practices that help to reduce erosion.

About 85 percent of this soil is used for cultivated crops, mainly cotton, sorghum, and rye. The remaining acreage is in native grasses used for grazing. Under good management, yields of forage are good. This soil is suitable for sprinkler irrigation. (Capability unit IVe-7; Deep Sand range site; Windbreak group 4)

Spur Series

The Spur series consists of deep, dark-colored, mildly alkaline or moderately alkaline, nearly level soils that formed under tall grasses in recently deposited alluvium. These soils occur on the flood plains of the major rivers and creeks and their tributaries. They are seldom to frequently flooded.

The surface layer, about 14 inches thick, is brown loam or clay loam that contains calcium carbonate. This layer has granular structure and absorbs water at a moderate rate.

The subsoil, about 15 inches thick, is reddish-brown loam that contains calcium carbonate. This layer has blocky structure and absorbs water well.

Below the subsoil, in most places, is reddish-brown material that contains calcium carbonate and is made up of several layers. For the most part, the texture of this material is loam.

The Spur soils are naturally well drained. They have slow runoff. Their capacity to hold water is high. The natural fertility is high, and yields of most crops generally are high.

Spur clay loam (Sm) (0 to 1 percent slopes).—This well-drained soil occupies bottom lands that are occasionally to seldom flooded. It is clay loam throughout the profile.

Included in mapping were scattered areas of Spur loam, Mangum clay, and Yahola fine sandy loam, generally 5 acres or less in size. Also included were a few areas that have a reddish-brown surface layer instead of a brown one.

The plow layer of this soil is easily tilled. If it is worked when too wet, however, a hard crust forms. Water passes through this soil at a moderately slow rate. The available water capacity is high. Fertility is high, and high yields can be expected under good management. Some areas, however, are flooded too often for maximum production. Maintaining soil structure and controlling floodwaters are the main problems.

Nearly all of this soil is used for cultivated crops. Cotton, wheat, and alfalfa are the main crops, but all crops and grasses that are common to the area can be grown. This soil is suitable for irrigation. (Capability unit IIw-1; Loamy Bottom Land range site; Windbreak group 3)

Spur loam (Sn) (0 to 1 percent slopes).—This well-drained soil occurs on bottom lands that are occasionally to seldom flooded. It adjoins areas of Spur clay loam.

Included in mapping were scattered areas of Spur clay loam and Yahola fine sandy loam, generally 5 acres or less in size. Also included were a few areas that have a surface layer of reddish brown instead of brown.

The plow layer of this soil is easily tilled. Excessive tillage, however, pulverizes the soil and makes it more likely to blow. Fertility is high. Water passes through this soil at a moderate rate. The available water capacity is moderate. Some areas are flooded too often for maximum production.

This soil is used for cultivated crops, mainly cotton, wheat, and alfalfa. It is suitable for irrigation. (Capability unit IIw–1; Loamy Bottom Land range site; Windbreak group 3)

Spur soils, channeled (So).—These well-drained soils occur along the smaller creeks and tributaries and are subject to frequent flooding. In general, the flood plains of these creeks are less than 600 feet wide, and there are few smooth areas larger than 5 acres between the stream channels.

Included in mapping were a few small areas of silty clay loam, clay, or sandy loam.

These soils are used for grazing or pasture and probably are best suited to those uses. They generally are not suited to cultivation, because stream channels meander through them. If the grasses are well managed, high yields of forage can be obtained, but in a few areas a concentration of salts limits the vegetation to plants that tolerate salt. (Capability unit Vw–2; Loamy Bottom Land range site; Windbreak group 5)

St. Paul Series

The St. Paul series consists of deep, dark-colored, nearly level or gently sloping soils. These soils formed under short and mid grasses in old alluvium or in material weathered from silt, shale, and sandstone of Permian age. They occur on uplands in the northern half of the county.

The surface layer, about 12 inches thick, is dark grayish-brown silt loam that is free of calcium carbonate and is neutral in reaction. It has granular structure and is easily worked. It is porous and absorbs water well.

The subsoil is about 46 inches thick and has blocky structure (fig. 11). The upper part is dark grayish-brown or dark-brown silty clay loam that is mildly alkaline. The lower part is reddish-brown silty clay loam or clay loam that contains calcium carbonate.

The underlying material generally is yellowish-red, calcareous clay loam over sandstone or sandy shale of Permian age.

The St. Paul soils are naturally well drained. Internal drainage is slow, permeability is moderately slow, and the available water capacity is high. The natural fertility is high.

St. Paul silt loam, 0 to 1 percent slopes (SpA).—This well-drained soil on uplands is one of the most extensive soils in the county.

Included in mapping were scattered areas of Woodward loam and Tillman clay loam, generally 5 acres or less in size. Also included were a few areas in which the surface layer is thinner than that of typical St. Paul soils and also areas in which reddish-brown subsoil material has been mixed with the original surface layer through tillage.

The plow layer of this soil is easily worked. Excessive tillage, however, pulverizes it and makes it more likely to blow. The depth of tillage should be varied to keep a plowpan from forming. Water passes through this soil at a moderately slow rate, and the available water capacity is high. Nevertheless, conserving moisture is necessary. The fertility is high, and good yields can be expected if the soil is well managed.

Nearly all of this soil is used for cultivated crops. Small grain is best suited, but all crops commonly grown in the county do well in years of adequate moisture. This soil is suitable for irrigation. (Capability unit IIc–1; Hardland range site; Windbreak group 4)

St. Paul silt loam, 1 to 3 percent slopes (SpB).—This soil adjoins St. Paul silt loam, 0 to 1 percent slopes. Its surface layer, about 8 inches thick, is thinner than that in typical St. Paul soils. Also, the upper part of the subsoil is more reddish. The surface layer is reddish brown in some areas that have been cultivated, as part of the underlying subsoil has been mixed with the original surface layer.

Included in mapping were scattered areas, generally 5 acres or less in size, of Woodward loam and Tillman clay loam.

The plow layer of this soil is easily tilled. The main management problems are controlling water erosion and maintaining soil structure and fertility. Among practices that can be used to help control erosion are stubble-mulch tillage, contour farming, and field terraces.

Nearly all of this soil is used for cultivated crops. Wheat, cotton, and grain sorghum are the main crops. Yields are satisfactory if the soil is well managed. This soil is suitable for irrigation. (Capability unit IIe–1; Hardland range site; Windbreak group 4)

Tarrant Series

The Tarrant series consists of very shallow, gently sloping or sloping soils on uplands in the western part

Figure 11.—**Profile of a St. Paul silt loam that shows blocky structure.**

of the county. These soils formed under mid and tall grasses in clayey Permian material that contained layers of dolomitic limestone.

The surface layer, about 6 inches thick, is dark-brown loam. It contains calcium carbonate and has granular structure. Many small fragments of limestone are on the surface.

Beneath the surface layer are beds of dolomitic limestone that are interbedded with red and gray clay of the red beds. These beds average about 20 inches in thickness.

The Tarrant soils are well drained. Runoff is medium or rapid, internal drainage is medium, and permeability is moderate. The available water capacity is low. Maintaining a good stand of grass and checking erosion are the main problems in management.

In this county the Tarrant soils are mapped only in a complex with the Weymouth soils.

Tillman Series

In the Tillman series are deep, reddish soils that formed under short and mid grasses in calcareous marine clays and clayey shales of Permian age. These soils occur on nearly level or gently sloping uplands, mainly south and east of Mangum and in the vicinity of Jester.

The surface layer, about 8 inches thick, is dark-brown clay loam that is free of calcium carbonate and is moderately alkaline. It has granular structure and easily forms a crust if it is tilled too much or tilled when too wet.

The subsoil is about 36 inches thick. The upper part of this layer is reddish-brown clay loam that has blocky structure, is free of calcium carbonate, and is moderately alkaline. The lower part is reddish-brown, blocky clay that contains calcium carbonate.

Below a depth of 44 inches, the soil material is similar to that from which the soils formed. It is a stiff, yellowish-red, calcareous clay that contains many soft concretions of calcium.

The Tillman soils are well drained. They have very slow internal drainage and permeability. Their available water capacity is high.

Tillman clay loam, 0 to 1 percent slopes (TcA).—This is a well-drained soil on uplands. Its surface layer, about 10 inches thick, is thicker than that of typical Tillman soils. East of Mangum some coarse pebbles are scattered over the surface, and, consequently, tillage is somewhat difficult.

Included in mapping were scattered areas, generally 5 acres or less in size, of Hollister clay loam and St. Paul silt loam.

The fertility of this soil is moderate to high. Water moves through the soil at a very slow rate. The available water capacity is high, but a moderate amount of water is lost through runoff. Some of the problems in managing this soil are increasing water intake, decreasing droughtiness, and maintaining soil structure. Proper management of crop residues, stubble-mulch tillage, and contour farming help to reduce erosion.

Nearly all of this soil is used for cultivated crops. Wheat is the main crop, but some cotton, alfalfa, and sorghum are grown with limited success. This soil is suitable for irrigation. (Capability unit IIs–1; Hardland range site; Windbreak group 4)

Tillman clay loam, 1 to 3 percent slopes (TcB).—This soil adjoins Tillman clay loam, 0 to 1 percent slopes. East of Mangum, some coarse pebbles are scattered over the surface, and, consequently, tillage is somewhat difficult. In a few places a concentration of salts makes the soil lighter colored than the surrounding soils, and a whitish crust tends to form on the surface after rains and between cultivations. Also, in a few areas the surface layer is thinner than that of typical Tillman soils. In some areas that have been cultivated, the surface layer is reddish brown because part of the underlying subsoil has been mixed with it.

Included in mapping were scattered areas of Weymouth clay loam, Vernon soils, and St. Paul silt loam. These areas generally are 5 acres or less in size.

Controlling water erosion, maintaining soil structure, increasing water intake, and decreasing droughtiness are the main problems in managing this soil. A large amount of water is lost through runoff. Water moves through this soil at a very slow rate, and the available water capacity is high.

Nearly all of this soil is used for cultivated crops. Small grain is best suited, but some cotton, sorghum, and alfalfa also are grown with limited success. This soil is suitable for irrigation. (Capability unit IIIe–1; Hardland range site; Windbreak group 4)

Tipton Series

The Tipton series consists of deep, dark-colored soils that formed under mid and tall grasses from calcareous old alluvium. These soils occupy nearly level or gently sloping areas on old terraces high above the streams.

The surface layer is brown or dark-brown loam, about 18 inches thick, that is free of calcium carbonate and is neutral or mildly alkaline. It has granular structure and is easily tilled. Also, it is porous and takes in water well.

The subsoil, about 32 inches thick, is brown or dark-brown clay loam that is free of calcium carbonate and is moderately alkaline. It has prismatic or granular structure. Roots, air, and water penetrate this layer easily.

The underlying material is yellowish-red, calcareous loam.

The Tipton soils are naturally well drained. Internal drainage is medium, permeability is moderate, and the capacity to hold water is moderate to high. Water erosion, however, is a hazard on the more sloping soils of this series. The natural fertility is high, and good yields of most crops can be expected.

Tipton loam, 0 to 1 percent slopes (TpA).—This well-drained soil occurs mainly near Hester. It occupies nearly level old terraces that are high above streams. Its profile is typical of the Tipton series (fig. 12).

Included in mapping were scattered areas of Abilene clay loam, Altus fine sandy loam, Enterprise very fine sandy loam, and Miles fine sandy loam. These areas generally are 5 acres or less in size.

Water passes through this Tipton soil at a moderate rate. The available water capacity is moderate to high. Fertility is high. The plow layer is easily worked, but excessive tillage pulverizes the soil and makes it more susceptible to blowing.

Nearly all of this soil is used for cultivated crops. Cotton, wheat, and alfalfa are the main crops, but all

Figure 12.—Profile of Tipton loam, 0 to 1 percent slopes. Spade shows the depth to which calcium carbonate has been leached.

crops and grasses commonly grown in this county are suited. If it is well managed, this is one of the most productive soils in the county. Some of it is irrigated. (Capability unit I–1; Loamy Prairie range site; Windbreak group 2)

Tipton loam, 1 to 3 percent slopes (TpB).—This soil adjoins Tipton loam, 0 to 1 percent slopes. Its surface layer, about 12 inches thick, is thinner than that of typical Tipton soils.

Included in mapping were scattered areas of Enterprise very fine sandy loam and Miles sandy loam, generally 5 acres or less in size.

The fertility of this Tipton soil is high. The plow layer is easily tilled. Water moves through the soil at a moderate rate; the available water capacity is high. A small amount of water is lost through runoff. The main problems in management are controlling water erosion and maintaining soil structure and fertility. Use of field terraces, contour farming, and stubble-mulch tillage helps to control erosion.

Nearly all of this soil is used for cultivated crops, mainly small grain, cotton, and grain sorghum. This soil is suitable for irrigation. (Capability unit IIe–1; Loamy Prairie range site; Windbreak group 2)

Tivoli Series

In this series are light-colored, sandy soils that formed under tall grasses in wind-laid, sandy deposits. These soils occur on uplands and adjacent to the larger streams.

The surface layer, about 8 inches thick, is brown fine sand or loamy fine sand that is free of calcium carbonate and is slightly acid.

The underlying material is uniform to a depth of many feet. It is reddish-yellow, loose fine sand or loamy fine sand that is free of calcium carbonate and is neutral in reaction.

The Tivoli soils are excessively drained. Internal drainage is rapid, runoff is slow, and permeability is rapid. These soils are low in natural fertility. Their available water capacity is low.

Tivoli fine sand (Tv) (0 to 30 percent slopes).—This soil is adjacent to the major rivers in the county and in dunelike areas on uplands.

Included in mapping were scattered areas of Nobscot fine sand and Tivoli loamy fine sand, generally 10 acres or less in size.

Tivoli fine sand is subject to severe wind erosion, and careful management of the native vegetation is needed to keep the soil from blowing. There are a few blowouts, generally 5 acres or less in size. Fertility is low. Water passes through the soil at a rapid rate, and the available water capacity is low.

Because this soil is sandy and occurs in steep areas, it is not suited to cultivated crops. Nearly all the acreage is used for limited grazing, but yields of forage are low, even if the soil is well managed. (Capability unit VIIe–1; Dune range site; Windbreak group 5)

Tivoli loamy fine sand (Tw) (0 to 12 percent slopes).—This soil occurs in hummocky areas on uplands and adjoins Springer loamy fine sand, 3 to 8 percent slopes. It has a surface layer about 7 inches thick and a subsoil of brown or reddish-yellow fine sand about 7 inches thick.

Included in mapping were scattered areas of Springer loamy fine sand and Nobscot fine sand.

The fertility of this Tivoli soil is low. Water passes through the soil at a rapid rate, and little is lost through runoff. The available water capacity is low. A few areas, generally 5 acres or less in size, have been severely eroded by wind.

This soil is not suitable for cultivated crops. Nearly all the acreage is in native grasses and is used for grazing. Moderate yields of forage can be obtained under good management. If grazing is controlled or deferred and grazed-out areas are seeded to suitable grasses, erosion can be controlled and the yields of forage improved. (Capability unit VIe–7; Deep Sand range site; Windbreak group 5)

Treadway Series

The soils of the Treadway series have very little profile development. They formed under a sparse cover of short grasses in reddish, clayey and loamy alluvium that contains calcium carbonate. They occur throughout the county on alluvial fans, aprons, and flood plains below outcrops of clayey red beds.

To a depth of 15 inches, the surface layer is reddish-brown clay loam that contains calcium carbonate. It is compact and sticky when wet.

This layer is underlain by massive, reddish-brown clay loam that also contains calcium carbonate.

The Treadway soils are well drained but droughty. Runoff is rapid, and internal drainage and permeability are very slow. These soils are almost impervious to water, air, and plant roots.

Treadway soils (Ty) (0 to 2 percent slopes).—These soils consist of clayey and loamy soil materials that are reddish and compact. They occur on alluvial fans, aprons, and narrow flood plains below areas of Rough broken land or Badland. In a few areas a concentration of salts makes the soils lighter colored than the surrounding soils, and a whitish crust tends to form on the surface after rains.

Included in mapping were scattered areas of Mangum clay, Vernon soils, and Badland. These areas generally cover 10 acres or less.

The Treadway soils are low in fertility and are droughty. Water passes through them at a very slow rate, and a large amount is lost through runoff. Because the soils are low in organic-matter content and are only sparsely covered with vegetation, their surface layer tends to run together and to form a crust after rains.

These soils are not suitable for cultivated crops. Nearly all of their acreage is within areas of other soils that are used for grazing. The vegetation is sparse, however, and it provides little grazing. (Capability unit VIs–1; Red Clay Flats range site; Windbreak group 5)

Vernon Series

The Vernon series consists of shallow or very shallow, reddish soils on strongly sloping and moderately steep uplands. These soils formed under mid and short grasses in clayey shale and marine clay of the Permian red beds. They occur in small areas scattered throughout the county.

The surface layer of reddish-brown light clay contains calcium carbonate and is about 6 inches thick. It has granular structure, is very hard when dry, and is moderately alkaline.

Below this layer is reddish-brown, compact clay, about 10 inches thick, that contains calcium carbonate. The underlying bedrock is similar to it but is less developed. A few white spots or concretions of calcium carbonate occur in these layers.

The Vernon soils are well drained. Runoff is rapid, and internal drainage and permeability are very slow. The substratum is almost impervious to water and roots.

Vernon soils, 5 to 12 percent slopes (VeE).—These are the only Vernon soils mapped separately in this county. They are shallow to bedrock and occur on strongly sloping or moderately steep uplands.

Included in mapping were scattered areas of Weymouth clay loam, Treadway soils, and Badland. These areas generally are 10 acres or less in size.

The Vernon soils have low available water capacity and are droughty. Water passes through them at a very slow rate, and a large amount is lost through runoff.

These soils are not suitable for cultivated crops. Nearly all the acreage is in short and mid native grasses and is used for grazing. Only moderate to low yields of forage are obtained; even if the grasses are well managed. Practices that help to improve the yields of grasses and to slow down erosion are control of mesquite trees and control or deferment of grazing. (Capability unit VIe–8; Red Clay Prairie range site; Windbreak group 5)

Vernon-Weymouth complex, 10 to 20 percent slopes (VwF).—This complex consists of Vernon soils, Weymouth soils, Tarrant soils, Cottonwood soils, and outcrops of dolomitic limestone and gypsum. These soils and outcrops are so intricately mixed that it is not practical to show them separately on a map. The Vernon soils make up 60 percent of the complex, the Weymouth soils 20 percent, the Tarrant soils 5 percent, the Cottonwood soils 5 percent, and the outcrops 10 percent.

This complex occupies moderately steep broken uplands throughout the county. The areas are 10 acres or more in size. Those of less than 10 acres normally are mapped with the Vernon soils or with the Weymouth-Tarrant complex.

The surface layer of the Vernon soils in this complex is about 4 inches thick and is underlain by bedrock. It is thinner than the typical surface layer of Vernon soils. The profile of the Weymouth soils is similar to the one that is typical for the Weymouth series. The Tarrant soils have a surface layer about 4 inches thick, but in other respects the profile is similar to the typical profile. The profile of the Cottonwood soils in this complex is similar to that of typical Cottonwood soils.

The soils in this complex are low to moderate in fertility. They lose a large amount of water through runoff and are moderately slow to very slow in permeability to air, water, and roots.

These soils are not suited to cultivated crops. Nearly all the acreage is used for grazing. Moderate yields of forage can be obtained if the grasses are well managed. (Capability unit VIIs–3; Vernon soil, Red Clay Prairie range site; Weymouth soil, Hardland range site; Windbreak group 5)

Wet Alluvial Land

Wet alluvial land (Wa) occurs on narrow flood plains along the smaller creeks and tributaries in this county. It is cut by channels of meandering streams and is frequently flooded. The depth to the water table generally is 6 feet, but it may be only 3 feet during cool periods.

Because this land type is subject to frequent flooding, it continually receives new soil material. In a few places a concentration of salts makes the soil lighter colored than the surrounding soils, and a whitish crust tends to form on the surface after rains. The surface layer ranges from 10 to 18 inches in thickness, from sandy loam to loamy fine sand in texture, and from brown to dark grayish brown in color. It is mildly alkaline or neutral in reaction. The underlying material ranges from sandy loam to sandy clay loam and from brown to yellowish red. Calcareous material lies at a depth of 35 to 45 inches, and red beds of Permian age generally occur at a depth of 4 to 8 feet.

Wet alluvial land probably is best suited to grazing. Because it is frequently flooded and wet, it generally is not suited to cultivated crops, though some attempts have been made to cultivate areas that are within the boundaries of a cultivated field. Limitation of grazing and control of weeds help to improve the native grasses and, thus, to improve yields of forage. (Capability unit Vw–3; Subirrigated range site; Windbreak group 5)

Weymouth Series

In the Weymouth series are moderately deep, reddish soils that formed under mid grasses in clayey red beds of Permian age that were high in calcium carbonate. These soils occur on gently sloping to moderately steep

uplands. Calcium carbonate concretions occur on the surface and in all layers (fig. 13).

The surface layer, about 11 inches thick, is dark-brown clay loam that contains calcium carbonate. This layer has granular structure, is friable, and is easily penetrated by water and roots.

The subsoil, about 10 inches thick, is reddish-brown clay loam. It contains calcium carbonate and has granular structure.

The upper part of the underlying material, in which the largest amount of calcium carbonate has accumulated, is yellowish-red clay loam. About 10 to 40 percent of this layer consists of calcium carbonate concretions. The lower part is similar to the upper part, but the amount of calcium carbonate decreases with depth.

The Weymouth soils are well drained. Internal drainage is medium, permeability is moderately slow, and the available water capacity is moderate to high. Natural fertility is moderate or low. The main management problems are controlling water erosion and conserving moisture. Excessive tillage should be avoided.

Weymouth clay loam, 1 to 3 percent slopes (WeB).—This moderately deep soil on gently sloping uplands adjoins La Casa clay loam, 1 to 3 percent slopes, and

Figure 13.—**Profile of Weymouth clay loam that shows spots of calcium carbonate.**

Weymouth clay loam, 3 to 5 percent slopes. The surface layer, about 15 inches thick, is thicker than that of typical Weymouth soils; otherwise the profile is similar to the typical profile for the series.

Included in mapping were scattered areas of La Casa clay loam, generally 5 acres or less in size. In a few included areas, the surface layer is thinner than that of typical La Casa soils and is reddish brown because part of the underlying subsoil has been mixed with the original surface layer.

This Weymouth soil loses much water through runoff. Water passes through it at a moderately rapid rate, and the available water capacity is moderate to high. The main management problems are controlling water erosion, maintaining soil structure, decreasing droughtiness, and increasing water intake. Among the practices that slow erosion are constructing field terraces, using stubble-mulch tillage, and carefully managing crop residues.

About 85 percent of this soil is used for cultivated crops. Small grain is the crop best suited, but cotton, sorghum, and some legumes do well in years when the moisture supply is adequate. This soil can be irrigated. (Capability unit IIIe-1; Hardland range site; Windbreak group 4)

Weymouth clay loam, 3 to 5 percent slopes (WeC).—This soil normally occurs on uplands. It occupies gently sloping drainageways within areas of Abilene clay loam, Hollister clay loam, La Casa clay loam, and Tillman clay loam. The profile is similar to that of typical Weymouth soils.

Included in the areas mapped are scattered areas of Vernon soils, La Casa clay loam, and Tillman clay loam, generally 5 acres or less in size. Also included are eroded areas of 5 acres or less.

Water passes through this soil at a moderately slow rate; the available water capacity is moderate to high. A large amount of water is lost through runoff. The fertility is moderate to low. The main management problems are controlling water erosion, maintaining soil structure, and decreasing droughtiness. Erosion can be slowed by constructing field terraces, using stubble-mulch tillage, and carefully managing crop residues.

About 70 percent of this soil is used for cultivated crops. The rest is in native vegetation and is used for grazing. Small grain is the best suited cultivated crop. Yields are moderate if the soil is well managed. Irrigation is not well suited. (Capability unit IVe-1; Hardland range site; Windbreak group 5)

Weymouth clay loam, 3 to 5 percent slopes, eroded (WeC2).—This soil occurs in areas similar to those occupied by Weymouth clay loam, 3 to 5 percent slopes. The surface layer of this soil, however, is only about 4 inches thick because part of it has been eroded away. In many places part of the subsoil has been mixed with the original surface layer by tillage and the present surface layer is dark brown or reddish brown. In a few spots all of the original surface layer has been removed and the subsoil is exposed. Where rills and shallow gullies have been plowed over and smoothed, erosion is evident only in the color of the surface layer.

This Weymouth soil has low fertility. Water moves through it at a moderately slow rate. A large amount of water is lost through runoff. Among the management problems are controlling water erosion, increasing water intake, and maintaining structure and fertility. Erosion

can be slowed by constructing field terraces, by using stubble-mulch tillage, and by carefully managing crop residues.

All of this soil was once cultivated, but many areas are no longer used for crops. Some areas have been seeded to native grasses and probably are best suited to them. Nevertheless, all of this soil can be cropped if managed intensively. About 80 percent is in cultivation and is best suited to small grain, but yields of this crop generally are low. This soil is not suitable for irrigation. (Capability unit IVe–2; Hardland range site; Windbreak group 5)

Weymouth-Tarrant complex, 0 to 5 percent slopes (WmC).—This complex consists of Weymouth soils, Tarrant soils, and La Casa soils that are so intricately mixed that it is not practical to show them separately on a map. The Weymouth soils make up 65 percent of the complex, the Tarrant soils 25 percent, and the La Casa soils 10 percent. These soils occur on nearly level and gently sloping uplands and, in most places, adjoin the Vernon-Weymouth complex, La Casa clay loam, or Rough broken land. Outcrops of dolomitic limestone commonly are on the surface.

The Weymouth soils in this complex have a profile similar to the typical profile of the Weymouth series, but they contain a layer of dolomitic limestone instead of a layer of calcium carbonate. This limestone generally lies within 20 to 25 inches of the surface. The Tarrant soils have a profile similar to that of typical Tarrant soils. The La Casa soils have a profile similar to the typical one, except that in most places it has a dark-brown subsoil and is underlain by dolomitic limestone at a depth of 25 to 35 inches.

Included in the areas mapped as this complex are scattered areas, 10 acres or less in size, of the Vernon soils.

The soils in this complex are not suited to cultivated crops. Nearly all the acreage is used for pasture, though some attempts have been made to cultivate areas that occur within the boundaries of a cultivated field. Yields of forage are moderate if the grasses are well managed. (Capability unit VIs–2; Weymouth soil, Hardland range site; Tarrant soil, Shallow Prairie range site; Windbreak group 5)

Woodward Series

The Woodward series consists of moderately deep, reddish soils on gently sloping to moderately steep uplands. These soils formed under tall and mid grasses in weakly consolidated calcareous sandstone of the Permian red beds. They occur mainly in the northern part of the county.

The surface layer, about 11 inches thick, is reddish-brown loam that contains calcium carbonate. This layer has granular structure, is friable, and is easily penetrated by roots and water.

The subsoil, about 15 inches thick, is reddish-brown loam that contains calcium carbonate. It has granular structure and is porous. Water, air, and roots penetrate this layer easily.

The underlying material is red loam that contains some pieces of unweathered sandstone.

The Woodward soils are well drained. Internal drainage is medium, and permeability is moderate. The water-intake rate is good, and the available water capacity is moderate. Fertility is moderate. The main management problem is controlling water erosion and avoiding excessive tillage.

Woodward loam, 1 to 3 percent slopes (WoB).—This is a moderately deep soil on gently sloping uplands. It occurs mainly in areas adjacent to St. Paul silt loam, 1 to 3 percent slopes, or Woodward loam, 3 to 5 percent slopes.

Included in mapping were scattered areas of Quinlan loam and, near Lake Creek, a few areas of Mansic loam. These areas normally are 5 acres or less in size.

Water moves through this soil at a moderate rate. A moderate amount is lost through runoff. The available water capacity is moderate. Fertility is moderate to high. Some of the management problems are controlling water erosion and maintaining soil structure and fertility. Erosion can be slowed by constructing field terraces, by carefully managing crop residues, and by using stubble-mulch tillage.

Nearly all of this soil is used for cultivated crops, commonly small grain, cotton, and sorghum. If the soil is well managed, moderate to high yields can be expected. This soil is suitable for irrigation. (Capability unit IIe–1; Loamy Prairie range site; Windbreak group 4)

Woodward loam, 3 to 5 percent slopes (WoC).—This soil occurs in areas similar to those occupied by Woodward loam, 1 to 3 percent slopes. The surface layer, about 8 inches thick, is thinner than that of typical Woodward soils; otherwise, the profile is similar to the typical profile.

Included in mapping were scattered areas of Quinlan loam, normally 5 acres or less in size. Also included were a few eroded areas that have a surface layer less than 8 inches thick and are normally lighter colored than the surrounding soils.

This soil loses a large amount of water through runoff. Water moves through it at a moderate rate, and the available water capacity is moderate. Fertility is low to moderate. Controlling water erosion and maintaining soil structure and fertility are problems in management.

About 80 percent of this soil is used for cultivated crops, and the rest is in native range. Small grain is the best suited crop, but cotton and grain sorghum also are grown. This soil is suitable for irrigation. (Capability unit IIIe–2; Loamy Prairie range site; Windbreak group 4)

Woodward-Quinlan loams, 3 to 5 percent slopes (WwC).—This complex consists of Woodward soils and Quinlan soils that are so intricately mixed that it is not practical to show them separately on a map. About 65 percent of the mapping unit is Woodward soils, about 25 percent is Quinlan soils, and the remaining 10 percent is a soil that is intermediate between the Woodward and the Weymouth soils. In a few areas east of Willow, this intermediate soil makes up about 60 percent of the mapping unit.

The Woodward soil in this mapping unit has a profile that is similar to the one that is typical of the Woodward series. The Quinlan soil has a profile similar to the one that is typical of the Quinlan series. In the soil that is intermediate between the Woodward and the Weymouth soils, the surface layer is reddish-brown or brown loam, about 11 inches thick, and the subsoil is reddish-brown clay loam that has granular structure. The underlying material is yellowish-red or reddish-yellow clay loam. Calcium carbonate occurs in all layers.

The soils in this complex are suitable for cultivation, but they must be managed carefully. About 90 percent of the acreage is in native grasses and is used for grazing; the rest is in cultivated crops. This complex is not well suited to irrigation. (Capability unit IVe-3; Woodward soil, Loamy Prairie range site; Quinlan soil, Shallow Prairie range site; Windbreak group 5)

Yahola Series

In the Yahola series are deep soils that formed under tall grasses in calcareous recent sandy alluvium. These soils occur on the nearly level bottom lands of the major rivers in the county.

The surface layer, about 9 inches thick, is brown fine sandy loam that contains calcium carbonate. This layer has granular structure, is porous, and takes in water well.

The subsoil, about 27 inches thick, is reddish-brown fine sandy loam that contains calcium carbonate. This layer has granular structure; roots and water penetrate it easily.

Below a depth of 36 inches is sandy stratified material that is rapidly drained.

The Yahola soils are somewhat excessively drained. Runoff is slow, internal drainage is rapid, and permeability is moderately rapid. The available water capacity is moderate to low. Controlling wind erosion and preventing floods are the main problems.

Yahola fine sandy loam (Ya) (0 to 1 percent slopes).—This is the only Yahola soil mapped in the county. It occurs on nearly level flood plains of the larger rivers. It is occasionally flooded, but the floodwaters do not remain long.

Included in mapping were scattered areas of Spur loam and Spur clay loam, generally 5 acres or less in size.

This soil is moderate to high in fertility and is easily worked. Water passes through it at a moderately rapid rate; the available water capacity is low to moderate. There is little runoff.

About 70 percent of this soil is used for cultivated crops. The rest is in native grasses and is used for grazing. The main crops are cotton, wheat, grain sorghum, and alfalfa. If this soil is well managed, yields generally are moderate to high. This soil is suitable for irrigation. (Capability unit IIw 2; Loamy Bottom Land range site; Windbreak group 3)

Use and Management of Soils

In this section are discussed general management practices, capability groups of soils, estimated yields of crops, range management, woodland and windbreaks, wildlife, and engineering properties of the soils.

General Management Practices [1]

The main problems of management in growing tilled crops in Greer County are conserving moisture, controlling erosion, maintaining good tilth, and supplying sufficient amounts of plant nutrients to maintain productivity. Generally, a combination of practices is needed to improve the soils and to protect them from erosion. These general practices are discussed in the paragraphs that follow.

Cropping systems

A suitable cropping system helps to control erosion, to conserve soil moisture, to keep the soil in good tilth, and to maintain or improve productivity at the most economical cost. Also, it helps to control weeds, insects, and diseases.

Under certain conditions a nonlegume crop can be used in such a manner as to be a soil-improving crop. If wheat residue is used to improve a soil, nitrogen fertilizer is needed in most years to hasten decomposition of the residue and to prevent a nitrogen deficiency in the succeeding crop. In years of limited rainfall, however, nitrogen is not needed, because there is only a small amount of residue.

Alfalfa generally helps to improve a soil, especially if the last cutting is turned under. Alfalfa may need phosphate fertilizer. Grasses should be considered for use in a long cropping system. Rye can be used for soil improvement and as protection against erosion in critical periods; it does especially well on the Altus, Miles, Springer, Nobscot, and Yahola soils.

Major crops suited to the soils and climate of Greer County include wheat, cotton, rye, barley, oats, sorghum, guar, sweetclover, and sudangrass. Alfalfa is suited to the Spur and Yahola soils, which are on bottom lands, and to the more nearly level soils on uplands in years when the moisture supply is adequate.

Conserving and managing crop residues

Crop residues protect the soils against the wind. Leaving them on the surface or working them partly into the surface soil is a means of protecting soils that do not require stubble mulching. Protection against the wind normally is needed in winter and early in spring.

Stubble mulching (fig. 14) is a year-round system of farming designed to keep a protective cover of crop residues on the surface until the next crop is seeded and the seedlings are large enough not to need protection. This practice is necessary on the Altus, Brownfield, Enterprise, Meno, Miles, and Springer soils. Needed are

Figure 14.—**Wheat stubble on La Casa clay loam, 1 to 3 percent slopes. Stubble has been undercut and left anchored and evenly distributed on the surface.**

[1] Prepared with the assistance of MAURICE D. GAMBLE, conservation agronomist, Soil Conservation Service.

sweeps, rod weeders, and blades that undercut the soil and leave residues on the surface. The seeding equipment must be capable of drilling through this trashy cover.

Cover crops

Cover crops are needed to protect the Altus, Brownfield, Meno, Miles, Nobscot, Springer, and Yahola soils against wind erosion. Although any small grain is suitable, rye is best (fig. 15). It should be seeded early in fall so it will be tall enough to protect the soils in winter. This cover crop should remain on the soil during winter. It should be plowed under about April 1 if cotton or sorghum is to be planted. By using a special drill, rye can be seeded among the cotton stalks in September.

Fertilization

Except on a few soils, the use of fertilizer in Greer County is of questionable value, for the average annual rainfall is only 23.68 inches. (See table 8, page 70.) The soils most likely to be benefited by fertilization are the Altus, Brownfield, Enterprise, Meno, Miles, Nobscot, Springer, and Yahola soils. In years of adequate moisture, applications of nitrogen increase yields of wheat for pasture or grain. Most of the soils in this county do not need lime. Some may be improved by treatment with agricultural gypsum. The amounts of fertilizer used should be based on recommendations of the Oklahoma Agricultural Experiment Station.

Controlling erosion and conserving water

Water is the key to successful farming in this subhumid region. Generally, moisture is plentiful for planting crops, but in many years there is not enough moisture for good or even fair yields. Although in some areas water can be provided by irrigation, few farmers have access to an ample supply of water, nor do they have enough time and money to irrigate all their fields.

Most farmers need to use one or more of the following measures to control erosion or to conserve water: field terraces, diversion terraces, grassed waterways, contour farming, and minimum tillage. On most farms that include Altus, Brownfield, Meno, Miles, and Springer soils, stripcropping and deep plowing are needed for control of wind erosion.

Terraces, grassed waterways, and contour farming

Terraces reduce the erosion hazard, help to conserve water and to remove excess water, and serve as guidelines for contour farming. Some of the major soils in the county that are suitable for terraces are the Abilene, Hollister, La Casa, Lawton, Miles, St. Paul, Tillman, Weymouth, and Woodward soils.

Most terrace systems in this county need grassed waterways that provide safe outlets for excess water. Grassed waterways are also used in connection with drainage or irrigation systems and natural drains. They can be established on all soils in this county that need them.

The practice of plowing, planting, and tilling soils on the contour, instead of up and down the slope, has many advantages. Less water erosion occurs, and more water enters the soil. Crops grow better because they generally have more moisture available. Contour farming is essential if the soils have been terraced, and it is effective even if the soils have not been terraced.

Deep plowing

Deep plowing is a practice that controls wind erosion. The Altus, Brownfield, Meno, Miles, and Springer soils, which have a surface layer 7 or more inches thick, are suitable for deep plowing (fig. 16). The depth of plowing ranges from 16 to 24 inches. For good results, one-fourth to one-third of the furrow slice should be from the finer textured subsoil. Soils that are deep plowed need to be fertilized and then seeded to crops that produce a large amount of residue. If all the soils are suitable, an entire field should be deep plowed at one time.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and gener-

***Figure 15.*—Rye sown in cotton stalks as a cover crop on Miles and Altus fine sandy loams, 0 to 1 percent slopes.**

***Figure 16.*—A cultivated field of Miles and Brownfield soils, 0 to 3 percent slopes, that has been deep plowed to a depth of 20 inches to help control wind erosion.**

ally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible but unlikely major reclamation projects.

In the capability system, all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

Capability Classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I. Soils have few limitations that restrict their use.

Class II. Soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV. Soils have very severe limitations that restrict the choice of plants, require very careful management, or both.

Class V. Soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

Class VI. Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII. Soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-2 or IIIe-4. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation, and the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph. The Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

In this section each capability unit in Greer County is described, and use and management are discussed. The names of soil series represented are mentioned in the description of each capability unit, but this does not mean that all the soils of a given series are in the unit. To find the names of all the soils in any given capability unit, refer to the "Guide to Mapping Units" at the back of this report.

CAPABILITY UNIT I-1

In this capability unit is one deep, dark-colored, nearly level soil of the Tipton series. This soil is on high stream terraces. It is moderately permeable and loses little moisture through runoff. It is one of the most productive soils in the county. Much of the acreage is irrigated.

Cotton, wheat, and alfalfa are the main crops, but all the common crops and grasses are suited.

Maintaining soil structure is the main management problem. Minor problems are maintaining fertility, controlling runoff from higher areas, and preventing compaction.

CAPABILITY UNIT IIe-1

This unit consists of deep and moderately deep soils of the Carey, Enterprise, La Casa, Lawton, St. Paul, Tipton, and Woodward series. These soils are on uplands or high stream terraces and have a slope range of 1 to 3 percent. They have moderate to moderately slow permeability and lose only a moderate amount of moisture through runoff. They contain a moderate to large amount of organic matter and of available plant nutrients.

These soils are commonly used for small grain, cotton, and grain sorghum. Forage sorghum and alfalfa and other legumes do well in years when rainfall is high.

The main problems in managing these soils are controlling water erosion and maintaining soil structure and fertility.

CAPABILITY UNIT IIe-2

This unit consists of deep, nearly level soils of the Altus and Miles series. These soils are on uplands. They are moderately permeable and lose little if any moisture through runoff. They are fertile and have a moderate capacity for storing moisture and plant nutrients.

Cotton, grain sorghum (fig. 17), and wheat are the main crops. Also grown are alfalfa, sweetclover, cowpeas, guar, vetch, and rye.

The principal management problems are controlling wind and water erosion, maintaining fertility, and preserving soil structure.

CAPABILITY UNIT IIw-1

This unit consists of deep, dark-colored, fertile, nearly level soils of the Spur series. These soils are on bottom

Figure 17.—Good yield of grain sorghum on the Miles and Altus soils in capability unit IIe–2.

lands and are flooded occasionally. They have moderate or moderately slow permeability and lose little moisture through runoff. Some of the acreage is irrigated.

Cotton, wheat, and alfalfa are the main crops, but all the crops and grasses common in the county can be grown. Yields are not satisfactory in the areas that are flooded most often.

The main management problems are controlling floodwaters and maintaining soil structure. Maintaining fertility and preventing compaction and surface crusting are minor problems. Areas that are seldom overflowed and areas that are protected by flood-control structures can be managed in the same way as the soils in capability unit I–1.

CAPABILITY UNIT IIw–2

In this unit is one soil of the Yahola series. This soil is on bottom lands and is flooded occasionally. It has moderately rapid permeability and stores a moderate amount of moisture for plants.

Cotton, wheat, and grain sorghum are the main crops, but alfalfa and other crops and grasses also are well suited. About one-third of the acreage is in native range, which if well managed produces high yields of grass forage.

The principal management problems are controlling floodwaters, preventing compaction and surface crusting, and maintaining fertility. Wind erosion is a slight hazard.

CAPABILITY UNIT IIs–1

In this capability unit is one deep, reddish, nearly level, droughty soil of the Tillman series. This soil is on uplands. It is moderately well supplied with plant nutrients, but it is very slowly permeable to air, water, and roots, and it loses water through runoff after rains.

This soil is suited to small grain. Yields of cotton, sorghum, and legumes generally are moderate but are uncertain because of the lack of moisture.

The main problems in managing this soil are maintaining soil structure, increasing water intake, and overcoming droughtiness.

CAPABILITY UNIT IIc–1

This unit consists of deep, nearly level soils of the Abilene, Enterprise, Hollister, Lawton, Mansic, and St. Paul series. These soils are on uplands and high stream terraces. They have moderate to slow permeability but lose little if any moisture through runoff. They are easy to work and are among the most productive soils in the county, but they may not hold a supply of moisture adequate for good growth of crops in years when rainfall is less than normal.

These soils are suited to small grain. In years when rainfall is below normal, yields of cotton, sorghum, and legumes are uncertain.

The principal problem in managing these soils is maintaining soil structure. Conserving moisture and increasing intake of water are minor problems.

CAPABILITY UNIT IIIe–1

This unit consists of deep and moderately deep soils of the Acme, Tillman, and Weymouth series. These soils are on uplands and have a slope range of 1 to 3 percent. They are moderately to very slowly permeable and lose much rainwater through runoff. They are droughty and subject to erosion.

These soils are suited to small grain. Because of droughtiness, yields of cotton, sorghum, and legumes are uncertain.

The main management problems are controlling water erosion, maintaining soil structure, increasing intake of water, and decreasing droughtiness.

CAPABILITY UNIT IIIe–2

In this unit are deep and moderately deep soils of the Enterprise and Woodward series. These soils are on uplands and have a slope range of 3 to 5 percent. They are moderately permeable and lose much water through runoff. Their supply of plant nutrients is moderate.

Small grain, cotton, and sorghum are the main crops. Sweetclover and other legumes do well if rainfall is normal or above.

The principal management problems are controlling water erosion, preserving soil structure, and maintaining fertility.

CAPABILITY UNIT IIIe–3

This unit consists of deep soils of the Miles and Altus series. These soils are on uplands and have a slope range of 1 to 5 percent. They are moderately permeable and lose some water through runoff. They are moderate to low in plant nutrients.

Cotton, sorghum, and wheat are the main crops, but a legume such as sweetclover also does well. Areas in native range produce high yields of forage.

Controlling wind erosion and water erosion and maintaining fertility are the main management problems.

CAPABILITY UNIT IIIe–4

This unit consists of deep sandy soils of the Altus, Brownfield, Meno, Miles, and Springer series. These soils are on uplands and have a slope range of 0 to 3

percent. Permeability is moderate or moderately rapid, and there is little runoff. Wind erosion is a severe hazard. The supply of plant nutrients is low.

Cotton and sorghum are the main crops, but some small grain and legumes are grown also. Guar, cowpeas, sweetclover, and alfalfa are grown to improve the soils (fig. 18). Generally, alfalfa can be established by seeding it in sorghum stubble. Native grasses that are well managed also produce good yields.

The main management problems are controlling wind erosion and water erosion and maintaining fertility. In years of above-normal rainfall, water may accumulate in depressional areas of the Meno soils.

CAPABILITY UNIT IIIs-1

This unit consists of one deep, reddish, nearly level soil of the Mangum series. This soil is on bottom lands and is flooded occasionally. It can store a large amount of water, but the water is not readily available to plant roots, and consequently this soil is droughty. Runoff is slow.

This soil is used mainly as native range. Some areas are cultivated to small grain. Over a period of years, the average yield is only moderate. Because of droughtiness, crops fail or nearly fail at least 1 year out of 5.

Maintaining soil structure, preventing surface crusting, and increasing the intake of water are the principal management problems.

CAPABILITY UNIT IVe-1

This unit consists of one moderately deep soil of the Weymouth series. This soil is on uplands and has a slope range of 3 to 5 percent. Permeability is moderately slow, and a large amount of water is lost through runoff. Consequently, this soil is droughty and subject to erosion. It is low to moderate in productivity.

Figure 18.—**Cowpeas grown as a soil-improving crop on Springer loamy fine sand, 0 to 3 percent slopes.**

This soil is suited to native range, but if managed intensively it can be cultivated. Small grain is the most suitable crop.

The principal management problems are controlling water erosion, maintaining soil structure, and overcoming droughtiness.

CAPABILITY UNIT IVe-2

In this unit is one soil of the Weymouth series. It is on uplands, has a slope range of 3 to 5 percent, and has been eroded by water. Permeability is moderately slow, and a large amount of water is lost through runoff. This soil is droughty and low in productivity.

This soil is suited to native range, but it can be cultivated if it is managed carefully. Small grain is the most suitable crop. Cotton, sorghum, and legumes are grown, but yields of these crops generally are low.

The main management problems are controlling water erosion, maintaining soil structure, overcoming droughtiness, and increasing the intake of water.

CAPABILITY UNIT IVe-3

This unit consists of intermingled soils of the Woodward and Quinlan series. These soils are shallow to moderately deep over reddish, calcareous sandstone. They are on uplands and have a slope range of 3 to 5 percent. They are moderately permeable, but they lose a large amount of water through runoff. They are low to moderate in productivity.

These soils are suited to native grasses, but they can be cultivated if they are managed carefully. Nearly all the acreage is in native range, but a few areas are cultivated to cotton, sorghum, and small grain. Sweetclover does well as a soil-improving crop.

The principal management problems are controlling water erosion and maintaining soil structure.

CAPABILITY UNIT IVe-4

This unit consists of eroded soils of the Lawton, Quinlan, and Woodward series. These shallow to deep soils overlie reddish, calcareous sandstone or gravelly old alluvium. They are on uplands and have a slope range of 3 to 5 percent. They have moderate or moderately slow permeability and lose a large amount of water through runoff. They are low in productivity.

These soils are suited to native range, but they can be cultivated if they are managed carefully. Suitable crops are small grain and some legumes. Cotton and sorghum are grown, but yields of these crops are low.

The principal management problems are controlling water erosion, preserving soil structure, and maintaining fertility.

CAPABILITY UNIT IVe-5

This unit consists of one deep, brown soil of the Enterprise series. This soil has a slope range of 5 to 8 percent and is on breaks between bottom lands and old high stream terraces. It has moderate permeability but loses a large amount of water through runoff. Productivity is moderate.

This soil is suited to native grasses, but it can be cultivated if it is managed carefully. Small grain is the preferred cultivated crop, but cotton, sorghum, sweetclover,

and grasses that serve as temporary pasture are grown with limited success. Some fields are in native grasses and are used for grazing.

The main management problems are controlling water erosion and preserving soil structure. Minor problems are maintaining fertility and controlling wind erosion.

CAPABILITY UNIT IVe-6

In this unit is one soil of the Miles series. It is on uplands and has a slope range of 3 to 5 percent. Much of its surface layer has been removed by water erosion. This soil is moderately permeable to air, water, and roots, but it loses a large amount of water through runoff. It is low in plant nutrients.

This soil is suited to native grasses, but it can be cultivated if it is managed carefully. Cotton, sorghum, and small grain are the main crops. Yields generally are low. Legumes and temporary pasture grasses are grown in a few fields. All of this soil has been used for crops, but a few fields have been abandoned, and most of these have been seeded to native grasses.

The main management problems are maintaining fertility and controlling water erosion and wind erosion.

CAPABILITY UNIT IVe-7

This unit consists of deep, sandy soils of the Nobscot and Springer series. These soils are on uplands and have a slope range of 0 to 8 percent. Permeability is moderately rapid. Only a small amount of water is lost through runoff, but the amount held available to plants is small. The supply of plant nutrients is low.

These soils are better suited to grass than to cultivated crops, but cultivated crops can be grown under careful management. Cotton, sorghum, and small grain are the main crops. Legumes and temporary pasture grasses are grown with only limited success. Some fields are in native grasses and are used for grazing.

The principal management problems are controlling wind erosion and maintaining fertility.

CAPABILITY UNIT Vw-1

Sandy alluvial land consists of sandy areas that are about 2 to 6 feet above the channels of the Elm, North, and Salt Forks of the Red River. These areas are flooded frequently.

The surface layer of this land type is variable, but in most places it is brown loamy fine sand, about 7 inches thick. It is underlain by stratified material, generally pink fine sand, that resembles the recent sediments in the streambeds. Permeability is rapid or moderately rapid, and in most places the water table is within reach of deep-rooted plants. In a few areas there is a concentration of salts, and in these the vegetation is limited to salt-tolerant plants.

Most of the acreage in this unit is used for pasture and is suited to that use. Although the areas are moderately to highly productive, they are flooded too frequently to be suitable for cultivated crops.

CAPABILITY UNIT Vw-2

This unit is made up of channeled soils of the Spur series. These soils are on narrow, loamy bottom lands and are dissected by meandering streams. The areas are small and frequently flooded. In a few places there is a concentration of salts, and vegetation is limited to plants that are salt tolerant.

Generally, these soils are used for pasture. They are moderately to highly productive under good management. They are not suited to cultivation.

CAPABILITY UNIT Vw-3

This unit is made up of Wet alluvial land. It is on narrow, sandy and loamy bottom lands that have a seasonal high water table. In a few places there is a concentration of salts, and vegetation is limited to plants that tolerate salt.

The acreage in this unit is frequently flooded and is therefore not suitable for cultivation. It generally is used for pasture. Because the water table is within reach of deep-rooted plants, this unit is the most productive in the county for grasses. If satisfactory yields are to continue, however, the grasses must be well managed.

CAPABILITY UNIT VIe-1

Sandy broken land, which consists of sandy and gravelly deposits over clayey red beds, makes up this unit. This land occurs on moderately steep, broken drainageways adjacent to the rivers. In some areas geologic erosion has cut through the deposits and exposed the red beds.

These areas are suited only to permanent vegetation. Moderate yields of forage can be obtained under good management. Erosion by water and wind is severe, however, unless the grasses are well managed.

CAPABILITY UNIT VIe-2

Eroded sandy land makes up this capability unit. It consists of deep, sandy soil material that has been severely eroded by wind or water. Runoff is rapid in some areas because of the slopes. Areas left bare are susceptible to further erosion.

This land type is suited only to permanent vegetation. Nearly all of it was once used for crops but has since been abandoned. Some eroded areas have been seeded to native grasses. Fair yields of grass can be obtained under good management.

CAPABILITY UNIT VIe-3

This unit consists of deep, loamy and gravelly soils of the Lawton series. These soils are underlain by beds of granitic gravel or rock and have a slope range of 3 to 8 percent. They are on gently sloping and sloping uplands, adjacent to the Wichita Mountains in the eastern part of the county. They lose a large amount of moisture through runoff.

These soils are suited only to permanent vegetation, and nearly all areas are in native grasses. Good yields can be obtained if the grasses are well managed.

CAPABILITY UNIT VIe-4

This unit consists of one deep, sandy soil of the Nobscot series. The slope range is 5 to 12 percent. This soil is on uplands and is subject to severe wind erosion and water erosion if cultivated. It absorbs water at a moderately rapid rate but retains little for plant use.

This soil is suited to grazing. Nearly all areas have a cover of shinnery oak and tall grasses. Moderate yields of forage can be obtained if the vegetation is well managed.

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CAPABILITY UNIT VIe-5

This capability unit consists of one soil of the Quinlan series. This shallow soil has a slope range of 8 to 20 percent. It is on uplands or in V-shaped, entrenched drainageways. It loses a large amount of moisture through runoff and is subject to severe erosion unless it is well managed.

This soil is not suited to cultivation. Nearly all areas are in native grass and are used for grazing. Fair yields of forage can be obtained if the vegetation is well managed.

CAPABILITY UNIT VIe-6

This unit consists of intermingled soils of the Quinlan and Woodward series. These reddish, loamy soils are shallow to moderately deep over calcareous sandstone. They are on uplands and have a slope range of 5 to 12 percent. Consequently, they are subject to severe erosion and lose a large amount of moisture through runoff. They are moderate to low in plant nutrients and can hold only a limited amount of moisture for plant use.

These soils are too steep for cultivation but are suited to permanent vegetation. Nearly all areas have a cover of native grasses and are used for pasture. Fair to good yields of forage can be obtained under good management.

CAPABILITY UNIT VIe-7

This capability unit consists of one deep, sandy soil of the Tivoli series. This soil occupies hummocky areas on uplands and has a slope range of 0 to 12 percent. It is subject to severe wind erosion if it is cultivated. It absorbs water rapidly but retains little for plant use.

This soil is suited to grazing. If grazing is controlled, nearly all the areas have a good cover of native tall grasses. Little erosion occurs if the grass cover is maintained.

CAPABILITY UNIT VIe-8

This capability unit consists of soils of the Vernon series. These soils are shallow over bedrock and are clayey. They are on uplands and have a slope range of 5 to 12 percent. They are droughty, for they lose a large amount of water through runoff and can hold only a small amount available for plants.

These soils are suited to grazing. Nearly all areas have a cover of native short and mid grasses. Moderate to low yields of forage are obtained if the grasses are well managed.

CAPABILITY UNIT VIs-1

This capability unit consists of nearly level, reddish, compact, clayey or loamy soils of the Treadway series. These soils are on fans, aprons, and flood plains below rough, broken or gullied areas. They lose a large amount of water through runoff and are almost impervious to air, water, and roots. In a few areas there is a concentration of salts, and vegetation is limited to salt-tolerant plants.

Because these soils are low in fertility and are droughty, they are not suited to cultivation. Their native vegetation is sparse, and yields of forage are low even under the best management.

CAPABILITY UNIT VIs-2

This unit is made up of intermingled soils of the Weymouth and Tarrant series. These soils are moderately deep to very shallow to bedrock. They are on the uplands and have a slope range of 0 to 5 percent. These soils formed in highly calcareous, clayey red beds that are interbedded with dolomitic limestone. They lose a moderate amount of moisture through runoff, have moderate to moderately slow permeability, and hold a moderate to low amount of moisture for plant use. Fertility is moderate.

These soils are suited to permanent vegetation. Good yields of forage can be obtained under good management.

CAPABILITY UNIT VIIe-1

This unit consists of one soil of the Tivoli series. This deep soil is rapidly permeable and has a low capacity for storing water. It is adjacent to the major rivers and in dunelike areas on uplands. It is only partly stabilized and includes a few active dunes. The slope range is 0 to 30 percent.

This soil has a cover of sand sagebrush and skunkbrush mixed with a limited amount of tall native grasses. It is not suited to cultivation and, even when well managed, furnishes very low yields of forage.

CAPABILITY UNIT VIIs-1

Badland makes up this capability unit. It consists of steep, rough areas and gently sloping flats that have undergone severe geologic erosion. Nearly all rainwater is lost through runoff because the soil materials are very slowly permeable. Most areas support only scant vegetation, and there are many bare areas because geologic erosion is active.

This land type has little value for grazing, but most of it lies within areas used for range. Because it is low in fertility, nearly barren, and droughty, it is not suited to cultivation.

CAPABILITY UNIT VIIs-2

This capability unit consists of intermingled soils of the Cottonwood and Acme series. These soils are on uplands and have a slope range of 0 to 5 percent. They are very shallow or moderately deep over gypsum and are droughty and low in fertility. Runoff is medium or rapid. Many areas are bare, and gypsum is exposed.

These soils are not suited to cultivated crops. They are suited only to permanent vegetation. Yields of forage are low. In places there are many redberry juniper trees.

CAPABILITY UNIT VIIs-3

This capability unit consists of intermingled soils of the Vernon and Weymouth series. These soils are very shallow or moderately deep over clayey red beds. They occur on steep, broken uplands throughout the county and have a slope range of 10 to 20 percent. Areas are included in which gypsum and dolomitic limestone have formed ledges, or steps (fig. 19), and there are bare areas of clayey material, gypsum, and dolomitic limestone. These soils lose a large amount of moisture through runoff. They are low to moderate in fertility and are moderately slow to very slow in permeability to air, water, and roots.

These soils are not suited to cultivation. They are suited only to permanent vegetation. Nearly all areas are in native grasses. If management is good, yields of forage are moderate.

CAPABILITY UNIT VIIs-4

This unit is made up entirely of Rock outcrop, which consists mostly of barren rock intermingled with small

Figure 19.—Ledges, or steps, of gypsum and dolomitic limestone on Vernon and Weymouth soils.

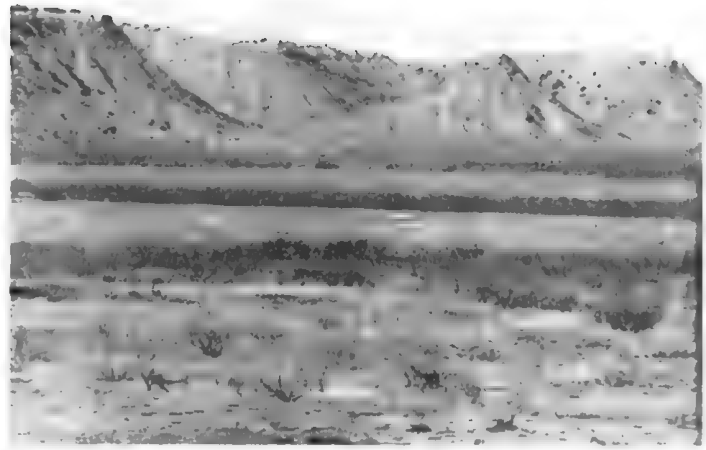

Figure 20.—In the background, an area of Rough broken land in capability unit VIIs-5. In the foreground, a Vernon soil that has been invaded by mesquite.

patches of loamy soil material overlying granite. This land type occurs in the rough granitic mountains in the eastern part of the county.

The acreage has little value for grazing, but most of it lies within areas that are used for range. It is suited only to permanent vegetation. In places there are many scrubby live oak trees.

CAPABILITY UNIT VIIs-5

Rough broken land makes up this unit. It consists of very shallow, clayey soil material on steep breaks in the western half of the county (fig. 20). This material loses a large amount of moisture through runoff and is subject to active geologic erosion. It is very slowly permeable to air, water, and roots.

The acreage has little value for grazing, but most of it is included within areas that are used for range. Livestock travel is restricted by steep escarpments.

Estimated Yields [2]

In this section are estimated yields of principal crops grown under dryland farming. Irrigation farming is not extensive in the county, and data on yields of irrigated crops are not available.

Dryland farming.—Estimated long-term average acre yields of the important crops in Greer County under two levels of dryland management are given in table 2. Total crop failures are included in the averages. Soils that are unsuitable for crops are not listed in the table.

The estimates in table 2 were prepared by soil scientists who made field surveys in the area. They were based on interviews with farmers and on observations made during the progress of the survey. They were confirmed by personnel of the Oklahoma State University who had access to records kept on the crops and soils of Greer County.

The estimated yields in columns A are those obtained under management that is customarily practiced by a substantial number of farmers in the county. It normally includes (1) using proper rates of seeding, dates of planting, and efficient harvesting methods; (2) controlling weeds, insects, and diseases to insure plant growth; (3) using terraces and contour farming where necessary; (4) deep plowing on the Brownfield, Meno, and Miles loamy fine sands and sands; and (5) using, for the most part, a moldboard or one-way plow.

The estimated yields in columns B are those obtained under improved management, which includes (1) using proper rates of seeding, proper dates of planting, and efficient harvesting methods; (2) controlling weeds, insects, and diseases; (3) using terraces and contour farming where necessary; (4) deep plowing on the Brownfield, Meno, and Miles soils; (5) adding fertilizer where required for optimum production; (6) using adapted, improved crop varieties; (7) planting cover crops on sandy soils that need protection from soil blowing; (8) managing crop residues and using tillage methods that are designed to prevent erosion, to increase water infiltration, and to promote emergence of seedlings; (9) keeping tillage to a minimum; and (10) using suitable cropping systems.

Conservation practices and fertilization are discussed in the section "General Management Practices."

Irrigation farming.—Yields of cotton, alfalfa, wheat, and sorghum are an estimated 15 to 60 percent higher on the irrigated soils of Greer County than those on the dryfarmed soils. Specific data on irrigated yields, by kinds of soil, are not available.

Irrigation farming requires greater investment per acre and more intensive management than dry farming, so it is important that irrigation be applied to those soils that likely will respond best. Soils of this county more suitable for irrigation farming are the nearly level soils of the Abilene, Altus, Enterprise, Hollister, Lawton, Miles, Spur, St. Paul, Tillman, Tipton, and Yahola series. On these soils, or any others, it is best to get the advice of engineers and others with technical experience in planning irrigation systems and in selecting crops for irrigated land.

Most irrigated areas are near Granite and Russell, where, in 1950, several irrigation wells were drilled. About four-fifths of the irrigaiton water in Greer County comes from these wells. Other irrigated areas are southeast of Mangum and in the vicinity of Hester. These areas receive their water from the W. C. Austin irriga-

[2] Prepared with the assistance of ROY M. SMITH, assistant professor, Oklahoma State University.

TABLE 2.—*Estimated average acre yields of principal dryfarmed crops under two levels of management*

[Yields in columns A are those obtained under customary management; yields in columns B are those to be expected under improved management. Absence of yield figure indicates that crop is not commonly grown on the soil at the level of management specified or that crop is not suited to the soil. Soils that normally are not suitable for crops are not listed on this table]

Map symbol	Soil	Capability unit	Wheat		Grain sorghum		Cotton (lint)		Forage sorghum		Alfalfa	
			A	B	A	B	A	B	A	B	A	B
			Bu.	*Bu.*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Tons* [1]	*Tons* [1]	*Tons*	*Tons*
AbA	Abilene clay loam, 0 to 1 percent slopes	IIc–1	16	22	22	32	235	325	2. 0	2. 8	1. 4	2. 0
AcB	Acme clay loam, 1 to 3 percent slopes	IIIe–1	10	14	13	18	125	175	1. 0	1. 8	------	------
At	Altus fine sandy loam	IIe–2	13	20	25	38	225	325	2. 2	3. 2	1. 0	2. 2
CaB	Carey loam, 1 to 3 percent slopes	IIe–1	13	19	23	35	190	275	1. 8	2. 6	1. 0	1. 8
EnA	Enterprise very fine sandy loam, 0 to 1 percent slopes.	IIc–1	15	20	25	35	250	330	2. 2	3. 0	1. 2	2. 0
EnB	Enterprise very fine sandy loam, 1 to 3 percent slopes.	IIe–1	13	18	22	30	225	300	2. 0	2. 8	1. 0	1. 8
EnC	Enterprise very fine sandy loam, 3 to 5 percent slopes.	IIIe–2	10	15	18	25	160	240	1. 5	2. 2	------	------
EnD	Enterprise very fine sandy loam, 5 to 8 percent slopes.	IVe–5	8	13	14	22	------	------	1. 2	1. 8	------	------
HcA	Hollister clay loam, 0 to 1 percent slopes	IIc–1	14	21	18	28	250	350	1. 5	2. 5	1. 0	1. 8
LaB	La Casa clay loam, 1 to 3 percent slopes	IIe–1	14	20	20	30	220	320	1. 2	2. 0	------	------
LtA	Lawton loam, 0 to 1 percent slopes	IIc–1	15	22	22	32	250	340	2. 2	3. 0	1. 2	2. 0
LtB	Lawton loam, 1 to 3 percent slopes	IIe–1	13	19	18	28	190	290	1. 8	2. 6	1. 0	1. 8
LtC2	Lawton loam, 3 to 5 percent slopes, eroded	IVe–4	8	12	------	------	------	------	1. 2	1. 8	------	------
Ma	Mangum clay	IIIs–1	7	12	------	------	------	------	------	------	------	------
McA	Mansic clay loam, 0 to 1 percent slopes	IIc–1	14	19	20	30	225	310	2. 0	2. 8	1. 0	2. 0
Me	Meno and Altus loamy fine sands [2]	IIIe–4	12	18	20	40	160	325	2. 0	3. 2	. 8	2. 2
MfC	Miles fine sandy loam, 3 to 5 percent slopes	IIIe–3	9	14	14	24	150	225	1. 2	2. 0	------	------
MfC2	Miles fine sandy loam, 3 to 5 percent slopes, eroded.	IVe 6	7	12	12	18	------	------	1. 0	1. 8	------	------
MuA	Miles and Altus fine sandy loams, 0 to 1 percent slopes.[2]	IIe–2	13	19	22	35	250	350	2. 0	3. 0	1. 0	2. 0
MuB	Miles and Altus fine sandy loams, 1 to 3 percent slopes.[2]	IIIe–3	12	17	18	28	210	300	1. 8	2. 7	------	------
MwB	Miles and Brownfield soils, 0 to 3 percent slopes.[2]	IIIe–4	12	18	20	28	180	260	1. 5	2. 5	------	------
NoC	Nobscot fine sand, 0 to 5 percent slopes	IVe–7	------	------	11	18	75	180	. 8	1. 8	------	------
QwC2	Quinlan-Woodward loams, 3 to 5 percent slopes, eroded.[2]	IVe–4	5	8	------	------	------	------	------	------	------	------
SgB	Springer loamy fine sand, 0 to 3 percent slopes.	IIIe–4	------	------	14	20	125	225	1. 2	2. 2	------	------
SgD	Springer loamy fine sand, 3 to 8 percent slopes.	IVe–7	------	------	10	15	60	150	. 8	1. 7	------	------
Sm	Spur clay loam	IIw–1	18	26	30	40	275	375	2. 3	3. 3	2. 2	3. 2
Sn	Spur loam	IIw–1	20	28	32	45	300	400	2. 5	3. 5	2. 5	3. 5
SpA	St. Paul silt loam, 0 to 1 percent slopes	IIc–1	15	22	22	32	235	325	2. 0	2. 8	1. 2	2. 0
SpB	St. Paul silt loam, 1 to 3 percent slopes	IIe–1	13	19	20	30	210	300	1. 8	2. 5	1. 0	1. 7
TcA	Tillman clay loam, 0 to 1 percent slopes	IIs–1	14	21	16	26	200	260	1. 4	2. 0	------	------
TcB	Tillman clay loam, 1 to 3 percent slopes	IIIe–1	13	18	14	22	180	240	------	------	------	------
TpA	Tipton loam, 0 to 1 percent slopes	I–1	17	24	28	38	270	370	2. 4	3. 2	1. 5	2. 5
TpB	Tipton loam, 1 to 3 percent slopes	IIe -1	15	21	23	33	250	335	2. 2	3. 0	1. 2	2. 0
WeB	Weymouth clay loam, 1 to 3 percent slopes	IIIe–1	100	14	13	18	200	240	1. 8	2. 4	------	------
WeC	Weymouth clay loam, 3 to 5 percent slopes	IVe–1	7	11	9	11	------	------	------	------	------	------
WeC2	Weymouth clay loam, 3 to 5 percent slopes, eroded.	IVe–2	5	9	6	9	------	------	------	------	------	------
WoB	Woodward loam, 1 to 3 percent slopes	IIe 1	12	17	18	24	170	250	1. 5	2. 2	------	------
WoC	Woodward loam, 3 to 5 percent slopes	IIIe–2	9	14	12	18	140	190	1. 2	1. 8	------	------
WwC	Woodward-Quinlan loams, 3 to 5 percent slopes.[2]	IVe–3	7	11	9	14	------	------	------	------	------	------
Ya	Yahola fine sandy loam	IIw–2	14	20	25	35	230	330	2. 2	3. 0	1. 8	2. 8

[1] Ovendry weight.
[2] Yields on these soils as they occur in this soil complex differ from yields on each soil where it occurs alone.

tion project, which provided the first irrigation water to a few farms in 1946.

Irrigation has steadily increased since the first wells were drilled. In 1950, a total of about 1,900 acres was irrigated; in 1961, the total had increased to between 10,000 and 11,000 acres. Nearly all irrigation is done by flood or furrow methods. In 1961, sprinklers were used on only 1,000 acres.

Crop yields have increased in Greer County under irrigation. Water management and maintenance of fertility

are required in irrigated areas. Additional information about irrigation farming can be found in the soil survey of neighboring Jackson County, Okla.

Range Management [3]

In this county about 169,000 acres, or about 41 percent of the total land area, is rangeland. There are only a few large ranches, so most rangeland is on small ranches or on livestock farms. The kinds of rangeland in the county differ greatly. They occur on bottom land along the major rivers and streams and on the mountains in the northeastern and eastern parts of the county.

Range sites and range condition

Range sites are distinctive kinds of rangeland, each of which produces a significantly different kind or amount of vegetation. A significant difference is one great enough to require different grazing use or management.

Range condition is rated in terms of condition classes to show the relation of the present vegetation to the original, or climax, vegetation of the site. Four range condition classes are defined. A range is in excellent condition if 76 to 100 percent of the vegetation is the same kind as that in the original stand; it is in good condition if the percentage is 51 to 75; it is in fair condition if the percentage is 26 to 50; and it is in poor condition if the percentage is less than 25.

The eighteen different range sites recognized in Greer County are briefly described in the following paragraphs, and important soil characteristics and principal grasses are given for each site. The names of the soil series represented are mentioned in the description of each range site, but this does not mean that all the soils of a given series are in the site. To find the names of all the soils in any given range site, refer to the "Guide to Mapping Units" at the back of this report.

SUBIRRIGATED RANGE SITE

This range site consists of Wet alluvial land, which occurs on narrow flood plains within sandy areas of the upland and is subject to frequent flooding. The water table is 3 to 6 feet below the surface. Generally, red beds lie at a depth of 5 to 8 feet.

If this range site is in excellent condition, the dominant grasses generally are switchgrass and Canada wildrye. If the site is heavily used, alkali sacaton and inland saltgrass increase. This range site makes up only 2 percent of the rangeland in the county, but it is the most productive per acre.

LOAMY BOTTOM LAND RANGE SITE

This site consists of deep, nearly level soils of the Spur and Yahola series. These soils occur on the flood plains of the main creeks and rivers. They are subject to flooding and receive runoff from higher areas. Permeability ranges from moderately rapid to moderately slow.

Normally, this site supports switchgrass, vine-mesquite, western wheatgrass, sand bluestem, and sideoats grama. An increase of buffalograss is a sign of too close grazing. This site makes up about 5 percent of the rangeland in the county.

HEAVY BOTTOM LAND RANGE SITE

This site is made up of one soil of the Mangum series. This soil is on the bottom land of Haystack Creek and along narrow drains leading to the Salt Fork of the Red River (fig. 21). It is a dense clay and is droughty and very slowly permeable. It is flooded occasionally and receives runoff from higher areas.

If this site is in excellent condition, the dominant grasses are vine-mesquite, western wheatgrass, white tridens, and buffalograss. Mesquite and cactus invade and increase if the site is overgrazed. Alkali sacaton and inland saltgrass occur where the soil is slightly saline. This site makes up about 4 percent of the rangeland in the county.

SANDY BOTTOM LAND RANGE SITE

Sandy alluvial land makes up this range site. It is on uneven, deep, sandy flood plains just above the river channels. Small areas are subirrigated. Floodwaters cause scouring and deposit sandy sediments that form hummocky areas, especially near the river channels.

Normally, this site supports switchgrass, sand bluestem, little bluestem, and indiangrass. Woody plants that increase if the site is overgrazed are tamarisk, willow, cottonwood, and sand sagebrush. This site makes up about 5 percent of the rangeland in the county.

SANDY PRAIRIE RANGE SITE

This site consists of deep soils of the Altus and Miles series and of Sandy broken land. These soils have slopes that range from 0 to 20 percent. They have a fine sandy loam surface layer and, normally, a sandy clay loam subsoil. Sandy broken land occurs on strongly sloping to steep drains leading to the Elm and Salt Forks of the Red River.

Sand bluestem and little bluestem make up much of the vegetation on this site when it is in excellent condition. Skunkbrush and sand sagebrush are common woody invaders. Blue grama is likely to increase if the taller

Figure 21.—**Heavy Bottom Land range site. This range site is highly productive if it is grazed moderately.**

[3] Prepared with the assistance of FRED L. WHITTINGTON, range conservationist, Soil Conservation Service.

grasses are grazed heavily. About 6 percent of the rangeland in the county is in this site.

DEEP SAND SAVANNAH RANGE SITE

This site consists of deep, sandy soils of the Brownfield and Nobscot series. These soils are on uplands and have slopes that range from 0 to 12 percent. They take in water rapidly and lose little if any through runoff. Their available moisture capacity is moderate.

When this site is in excellent condition, sand bluestem, little bluestem, indiangrass, and sand lovegrass make up most of the vegetation. A scattering of shinnery oak is normal with these grasses, and if the site is abused, this oak increases and becomes the main vegetation. This range site makes up about 2 percent of the rangeland in the county.

DEEP SAND RANGE SITE

This site consists of deep, productive, sandy to loamy soils of the Altus, Meno, Miles, Springer, and Tivoli series. These soils have slopes that range from 0 to 12 percent, and some are dunelike. They take in water rapidly and lose very little moisture through runoff. Their available moisture capacity is moderate to low.

If this site is in excellent condition, the principal grasses are sand bluestem, little bluestem, switchgrass, and indiangrass. In poorly managed areas, woody plants, such as sand sagebrush (fig. 22) and skunkbrush, are likely to be dominant. About 5 percent of the rangeland in the county is in this site.

LOAMY PRAIRIE RANGE SITE

This site consists of soils of the Acme, Carey, Enterprise, Lawton, Mansic, Tipton, and Woodward series. These soils are on uplands and have slopes that range from 0 to 12 percent. Their surface layer and subsoil are very fine sandy loam, loam, or clay loam. Permeability is moderate or moderately slow, and the available moisture capacity is moderate to high. These soils are deep enough for plant roots to develop, and as a result, the taller grasses are likely to be more abundant than the short grasses.

Areas of this range site that are still in native range generally are small and difficult to manage, but there are a few large, isolated areas. Sand bluestem, little bluestem, switchgrass, and sideoats grama are the main grasses if this site is in excellent condition. In overgrazed areas buffalograss and blue grama increase at the expense of the higher producing grasses. This site makes up about 9 percent of the rangeland in the county.

HARDLAND RANGE SITE

This site consists of deep or moderately deep soils of the Abilene, Hollister, La Casa, St. Paul, Tillman, and Weymouth series. These soils are on uplands and have slopes that range from 0 to 20 percent. Their surface layer is silt loam or clay loam. Permeability is moderately slow to very slow in the subsoil.

The yields of forage are limited on this site because the soils are droughty and take in water slowly (fig. 23). As a result, the site supports mid and short grasses, mainly blue grama and buffalograss. In drains and other areas that receive extra moisture, taller grasses are present, such as vine-mesquite, sideoats grama, and sand bluestem. Mesquite is the main woody invader. This range site makes up about 13 percent of the rangeland in the county. Most areas are confined to small pastures.

SHALLOW PRAIRIE RANGE SITE

This range site consists of shallow and very shallow soils of the Quinlan and Tarrant series. These soils are on uplands and have slopes that range from 0 to 20 percent.

If this range site is in excellent condition, common grasses are little bluestem and sideoats grama on the Quinlan soil and blue grama, sideoats grama, and little bluestem on the Tarrant soil. In heavily grazed areas of the Quinlan soils, blue grama, sand dropseed, and western

***Figure 22.*—Deep Sand range site in fair to poor condition. Sagebrush has invaded. This site should be kept mainly in tall grasses.**

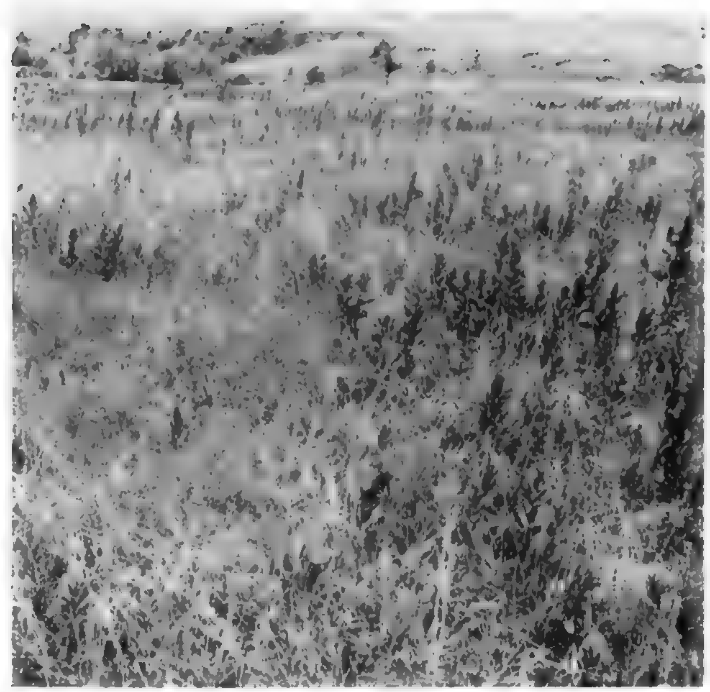

***Figure 23.*—In the foreground, an area of the Hardland range site in good condition. In the background, an area of the Red Clay Prairie range site.**

ragweed increase, and in heavily grazed areas of the Tarrant soil, hairy tridens and mesquite increase. This range site makes up about 6 percent of the rangeland in the county.

ERODED SANDY LAND RANGE SITE

Eroded sandy land makes up this site. It occurs on gently sloping to strongly sloping uplands. All of the acreage was once cultivated, but it is now gullied or has been damaged by severe sheet erosion. There are a few blowouts. Most areas have been seeded to grass or have been left idle.

When this site is in excellent condition, it contains mostly tall grasses. Usually it supports plants such as silver bluestem, sand dropseed, and other grasses and weeds that produce low yields of forage. About 1 percent of the rangeland of the county is in this site.

RED CLAY PRAIRIE RANGE SITE

This site consists of shallow and very shallow red clays of the Vernon series. These soils are in scattered areas on uplands throughout the county and have slopes that range from 5 to 20 percent. They have a granular surface layer but are underlain by dense clay. They take in water very slowly and lose a large amount through runoff. Because of the slopes, shallowness, and very slow permeability, the production of forage is limited.

If this range site is in excellent condition, the common grasses are sideoats grama, blue grama, vine-mesquite, and buffalograss. Mesquite and broom snakeweed most commonly increase if grazing is heavy. The site makes up about 14 percent of the rangeland in the county.

DUNE RANGE SITE

This range site consists of one soil of the Tivoli series. This soil is on dunes or in hummocky areas of the upland and has slopes of 0 to 30 percent. The main areas occur on the south side of the North Fork of the Red River, in the southeastern and northeastern parts of the county. The surface layer and substratum are fine sand. Water moves rapidly through the soil, and little is lost through runoff. The soil is subject to severe wind erosion and has low fertility.

This range site has a cover of sand sagebrush, skunkbrush, and some tall grasses. Sand bluestem, little bluestem, and big sandseed are the common tall grasses when the site is in excellent condition. Yields of forage are low. This site makes up about 3 percent of the rangeland in the county.

GYP RANGE SITE

This site consists of very shallow soils of the Cottonwood series. These soils are on uplands and have slopes of 0 to 5 percent. They have a loam surface layer and formed over impure beds of hard gypsum. Most areas are south of Reed and north of Jester. Because these soils are shallow and have low fertility, they support only a sparse stand of native vegetation; many areas are bare.

This site generally has a high percentage of forbs, mainly hairy goldaster. If the site is in excellent condition, common grasses are little bluestem, sideoats grama, and blue grama. An increase of hairy tridens and sand dropseed indicates overgrazing. Juniper is the main woody invader. This site makes up about 4 percent of

BREAKS RANGE SITE

This site consists of Rough broken land. Runoff is very rapid, and the soil materials are very shallow, very slowly permeable, and droughty. Because of the steep slopes, livestock do not graze this site so much as they do the sites that are adjacent to it.

This site is low in productivity, but it supports little bluestem, sand bluestem, and sideoats grama. It makes up about 7 percent of the rangeland in the county.

GRANITE HILLS RANGE SITE

Rock outcrop makes up this site. It consists of stony, rough, nearly barren areas on granitic mountains, mainly in the extreme eastern part of the county. Scattered throughout the site are patches of shallow soils that have limited available moisture capacity.

This range site supports little vegetation (fig. 24). The grasses are mainly little bluestem, sideoats grama, and hairy grama. There are a few small live oak trees or juniper shrubs. This site makes up about 2 percent of the rangeland in the county.

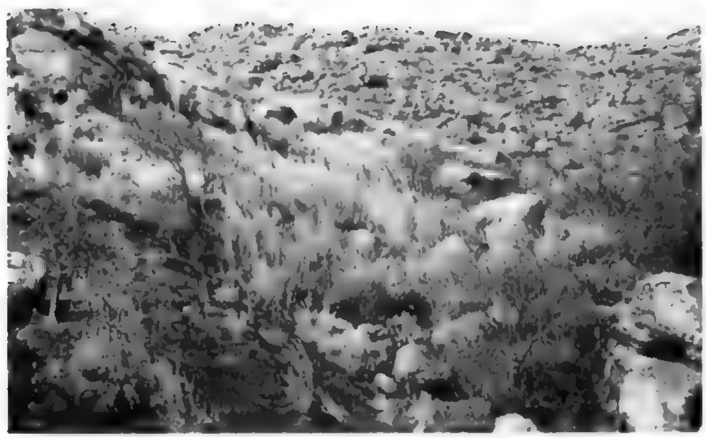

Figure 24.—Granite Hills range site.

RED CLAY FLATS RANGE SITE

This range site consists of raw, compact, alluvial soils of the Treadway series. These soils are on alluvial fans, aprons, and flood plains below outcrops of clayey red beds (fig. 25). They are low in fertility and are droughty. Moisture seldom penetrates to a depth of more than 10 inches. Some areas are slightly saline.

Even when this site is well managed, grass is difficult to establish. Vegetation is sparse and normally occurs where water concentrates. Forage production is very low. Common grasses are white tridens, buffalograss, vine-mesquite, and blue grama. Mesquite and cactus increase if the site is overgrazed. Alkali sacaton and inland saltgrass grow where the soils are slightly saline. About 2 percent of the rangeland of the county is in this site.

ERODED RED CLAY RANGE SITE

Badland makes up this range site. This land type consists of raw clayey areas that are mostly on gently sloping, nearly barren flats (fig. 26). Some areas are on steep escarpments. This site is very droughty and loses nearly all precipitation through runoff and evaporation. Moisture seldom penetrates to a depth of more than 10 inches.

Figure 25.—**Typical vegetation on Treadway soils in the Red Clay Flats range site.**

Sideoats grama is the main grass when this site is in excellent condition. Alkali sacaton and silver bluestem also are common. Mesquite and cactus are invaders. This site is one of the largest in the county; it makes up 10 percent of the rangeland.

Potential yields of herbage

The range sites in the county and an estimate of the potential yield from each site when it is in excellent condition are shown in table 3. The estimates are based on yields produced in counties in the western part of Oklahoma that have the same sites and similar climate and soils. Not enough data were available on yields in Greer County.

TABLE 3.—*Estimated annual yields of herbage, in pounds per acre, on range sites in Greer County, Okla.*

Range site	Yield of herbage in—	
	Favorable years	Unfavorable years
Subirrigated	8, 500	6, 000
Loamy Bottom Land	5, 500	3, 000
Heavy Bottom Land	4, 500	2, 500
Sandy Bottom Land [1]	4, 000	2, 400
Sandy Prairie	3, 800	2, 000
Deep Sand Savannah	3, 700	1, 800
Deep Sand	3, 500	1, 500
Loamy Prairie	3, 500	1, 500
Hardland	2, 800	1, 300
Shallow Prairie	2, 400	1, 100
Eroded Sandy Land	2, 300	1, 000
Red Clay Prairie	2, 200	1, 000
Dune	1, 800	900
Gyp	1, 700	900
Breaks	1, 500	1, 000
Granite Hills	1, 300	800
Red Clay Flats	900	400
Eroded Red Clay	600	200

[1] Productivity varies from place to place, partly because the site is dissected by streams and is subject to flooding and scouring.

Woodland, Windbreaks, and Post Lots [4]

Native woodland occurs along the Elm Fork, Salt Fork, and North Fork of the Red River; it also occurs less extensively along their tributaries. The most common trees are cottonwood, American elm, hackberry, and willow. In the eastern part of Greer County, American elm, hackberry, and live oak grow in patches on favorable slopes and along crevices in the granitic formations of the Wichita Mountains. Stunted oaks grow on the Nobscot and Brownfield soils in the northeastern, southeastern, and southwestern parts of the county. Eastern redcedar occurs throughout the county, but it is mainly on rough terrain along the principal rivers. Mesquite is common on the Vernon, Weymouth, Tillman, and other soils that have a slowly or very slowly permeable subsoil. Scattered stands of redberry juniper occupy some rangeland in the northwestern corner of the county. Generally, these trees are on the Cottonwood or Acme soils, which formed over gypsum.

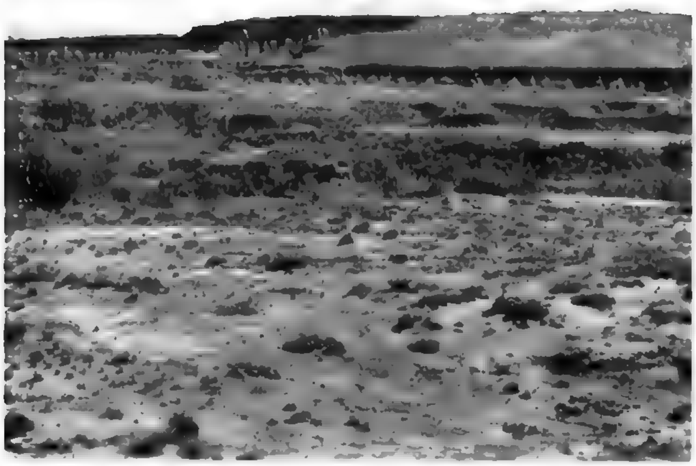

Figure 26.—**An area of the Eroded Red Clay range site showing the effects of geologic erosion and sparse vegetation. The strongly sloping areas in the background are in the Red Clay Prairie range site.**

[4] Prepared with the assistance of H. R. WELLS, soil conservationist, Soil Conservation Service.

Among the trees most commonly used as field windbreaks are cedar, pine, and other conifers and cottonwood, sycamore, Siberian elm, mulberry, poplar, and other deciduous trees. Evergreens provide the best protection and retain their vigor longer than most deciduous trees. Because evergreens are slow growing and are difficult to establish, the fast-growing but shorter lived deciduous trees are more commonly used. In some places deciduous trees are planted with conifers for early protection and then are removed when the evergreens have reached an effective height.

The trees grown as windbreaks to protect farmsteads, gardens, orchards, and livestock generally do not need to be so tall as those grown to protect fields. Normally, they receive better care and are watered. Consequently, the plantings can be on shallower, finer textured soils, and the choice of suitable trees and shrubs is wider.

Post-lot plantings are practical on many soils in this county. The trees most commonly used for posts are shown in the windbreak groups that follow.

Suitability of soils for windbreaks

The soils in Greer County have been placed in five groups according to their suitability for windbreaks and

post lots. These groups are discussed in the following paragraphs. The names of the soil series represented are mentioned in the description of each windbreak group, but this does not mean that all the soils of a given series are in the group. To find the names of all the soils in the windbreak group, refer to the "Guide to Mapping Units" at the back of this report.

WINDBREAK GROUP 1

This group consists of deep fine sandy loams and loamy fine sands of the Altus, Brownfield, Meno, Miles, and Springer series. These soils are on uplands and have a slope range of 0 to 3 percent. They are well drained and lose little water through runoff. Their available water capacity is moderate to high. Wind erosion is a moderate to severe hazard.

These soils are well suited to field windbreaks, farmstead windbreaks, and post lots. Trees grow best and live longest on those soils that are permeable to a depth of 6 feet or more. Such soils are common in the northeastern part of the county. The soils in the southern part have a thinner sandy mantle and generally are less favorable for trees.

The tall trees most commonly used as windbreaks in this county are cottonwood, sycamore, and Siberian elm. Cottonwood may reach a height of 100 feet in 20 years on the soils of this group that have a surface layer of loamy fine sand and are permeable to a depth of at least 6 feet. Generally, they reach a height of 80 feet or less on the soils that have a surface layer of fine sandy loam. Sycamore has much the same soil requirements as cottonwood, but it seldom grows to a height of more than 65 feet in a 20-year period. Siberian elm does well on all soils of this group, but it reaches its maximum height on those that have a fine sandy loam surface layer. This tree may attain a height of 85 feet in 20 years, but it seldom grows to a height of more than 70 feet.

Russian mulberry is suitable as an intermediate tree or as a shrublike barrier in a windbreak with cottonwood and sycamore trees. Conifers suitable for these soils include eastern redcedar, Chinese arborvitae (nongrafted seedlings), Austrian pine, and ponderosa pine. These trees grow to a height of 30 to 40 feet in 20 years on the soils that are permeable to a depth of 6 feet or more. The pines are better suited than the cedar or the arborvitae to the soils that have a surface layer of loamy fine sand. The height of both deciduous trees and conifers averages as much as 25 percent less on the soils in which moisture penetrates to a depth of less than 6 feet.

Most commonly used for posts are black locust, mulberry, catalpa, and Osage-orange. Catalpa and Osage-orange are best suited to soils that have a fine sandy loam surface layer. All these trees except Osage-orange normally yield at least 6 posts per tree in 20 years. Higher yields can be obtained if the trees are cut selectively at an age of 8 to 12 years and if the sprouts that develop after the cutting are managed for successive harvests. Normally, Osage-orange is not harvested until it is at least 15 years old.

WINDBREAK GROUP 2

This group consists of deep loams or very fine sandy loams of the Enterprise and Tipton series. These soils are on terraces and have a slope range of 0 to 3 percent. They are well drained and lose only a slight to moderate amount of water through runoff. Their available water capacity generally is moderate.

These soils are suitable for field and farmstead windbreaks and for post lots. They are not so rapidly penetrated by water as the soils in group 1 and are likely to have less moisture available for plant use. Nevertheless, they are suited to about the same kinds of trees and shrubs, although cottonwood grows successfully on fewer sites on soils in this group than on soils in group 1.

Generally, the tall trees on soils of this group reach a height of 10 to 20 feet less than on soils in group 1 in a 20-year period. Trees of intermediate height, such as Russian mulberry and the conifers, grow to a height of 5 to 10 percent less. Trees used for posts normally take 2 to 3 years longer to reach harvest size.

WINDBREAK GROUP 3

This group consists of clay loams, loams, and fine sandy loams, of the Spur and Yahola series. These soils are on bottom lands of the major streams and their tributaries and are flooded occasionally. They are well drained and lose little water through runoff. Permeability is moderate or moderately slow in the Spur soils and moderately rapid in the Yahola soils. Normally, all the soils receive extra water from adjoining slopes.

These soils generally are suitable for field or farmstead windbreaks and for post lots. The trees commonly used are about the same as those for groups 1 and 2. The rate at which they grow and the maximum height they attain depend, in some degree, on runoff from higher areas and on the height of the water table. All factors must be considered in selecting a tree for a particular site. Cottonwood, sycamore, and pine, for example, have a more exacting moisture requirement than the other trees. Cottonwood and sycamore are well suited to sites that have a high water table. The height to which trees grow on these soils ranges from that of group 1 to that of group 4, and the potential for growing trees for posts has the same range.

WINDBREAK GROUP 4

This group consists of deep or moderately deep soils of the Abilene, Acme, Carey, Enterprise, Hollister, La Casa, Lawton, Mansic, Miles, Nobscot, Springer, St. Paul, Tillman, Weymouth, and Woodward series. These soils are on uplands and have a slope range of 0 to 12 percent. They vary widely. Some are droughty, some are low in available water capacity, and some lose much water through runoff. Others are moderately eroded.

These soils generally are suitable for farmstead windbreaks. They are not suitable for field windbreaks, because the trees do not grow tall enough to provide protection. If field windbreaks are needed, extra cropland must be taken out of production to provide sufficient space between trees and between rows so that each tree has enough moisture and room to grow. A few small tracts are suitable for post lots.

Siberian elm and honeylocust are the tall trees best suited to the soils in this group. They seldom grow to a height of more than 40 to 45 feet, but they grow rapidly during the first several years and thus provide early protection for the farmstead. Russian mulberry also grows well during the early years, but it normally attains a height of only 25 to 30 feet in 20 years. Because of their

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year-round foliage and long life, eastern redcedar and Chinese arborvitae are the most valuable trees for windbreaks. These trees grow slowly, however, and reach a height of only 20 to 25 feet in 20 years. Austrian pine grows still more slowly, but it generally is suited to all the soils in this group.

Shortleaf pine and loblolly pine grow rapidly during the early years on the soils that have a surface layer of fine sandy loam. They attain a height of 20 to 25 feet in 20 years. Because of their open foliage, pines may be used where air circulation is needed on the farmstead during the hot months in summer.

WINDBREAK GROUP 5

This group consists of Badland, Eroded sandy land, Rock outcrop, Rough broken land, Sandy alluvial land, Sandy broken land, West alluvial land, and soils of the Acme, Cottonwood, Enterprise, Lawton, Mangum, Quinlan, Spur, Tarrant, Tivoli, Treadway, Vernon, Weymouth, and Woodward series. Generally, these soils and land types are not suitable for field windbreaks, farmstead windbreaks, or post lots, because they are steep, shallow, rapidly permeable, or clayey. In addition, some areas are flooded frequently, and others have a high water table.

Intensive site preparation and cultural practices are needed before windbreaks can be established. Redcedar generally is the best suited tree.

Wildlife [5]

The important species of wildlife in Greer County are bobwhite quail, scaled quail, mourning dove, deer, jackrabbit, and wild turkey. A few furbearers, such as opossums, raccoons, skunks, and minks, live where the habitat is suitable. Predatory animals and birds are wolves, coyotes, foxes, bobcats, and small numbers of several species of hawks and owls. There are a few songbirds and, in winter and during migration seasons, a fair number of waterfowl.

Lake Altus and many farm ponds provide a fair amount of fishing. In some of the larger streams are black bass, small sunfish, channel and bullhead catfish, carp, and buffalo fish. In the Salt, North, and Elm Forks of the Red River, fish production is restricted by the limited flow and the lack of deep water. At times, excessive salinity of the Elm Fork inhibits production.

Wildlife habitats

Greer County has many kinds of soils that are well suited to intensive crop production. Such use leaves almost no habitat for wildlife. Some birds and animals use plantings at field edges, and migratory ducks eat waste sorghum and green small grain.

In this section the wildlife habitats are discussed in relation to the nine soil associations shown on the general soil map at the back of this report and described in detail in the section "General Soil Map." The best natural habitats are on bottom lands and breaks in associations 6, 7, and 8, which together make up about 32 percent of the county. Natural cover is present, and a limited acreage is cultivated. Associations 1, 8, and 9 have the highest potential for growth of windbreaks and other plantings suitable for wildlife. Crops grown in these areas, particularly cotton, are clean cultivated. This practice leaves no food and cover for wildlife.

Soil association 1 consists mainly of the Miles, Springer, and Tivoli soils. Most of it is in the northeastern and southern parts of the county. Overgrazed range, which is invaded mainly by sand sagebrush, provides some cover for wildlife, particularly quail and rabbits. On the Nobscot and Brownfield soils, shinnery oak provides food and cover for many species of wildlife. Field and farmstead windbreaks that are properly managed provide habitat for bobwhite quail, rabbits, songbirds, and furbearers.

Soil association 2 consists mainly of the St. Paul, Woodward, and Quinlan soils. These soils are intensively clean cultivated and consequently afford little in the way of wildlife habitat. Some shrubby cover grows in the more sloping areas of the Woodward and Quinlan soils that are used for range. The dominant cover is mid and tall grasses, sand sagebrush, and mesquite.

Soil association 3 is made up of the Hollister, Tillman, and Abilene soils. Because of intensive cultivation, these soils afford no habitat of any consequence. The small amount of rangeland has been grazed heavily and is being invaded by mesquite, which provides low-quality habitat for quail, jackrabbits, and mourning doves.

Soil association 4 consists mainly of the Lawton soils, but there are small areas of Spur soils and Rock outcrop. The gravelly Lawton soils and Rock outcrop support scattered tall and mid grasses, hawthorn, live oak, blackjack oak, sumac, skunkbrush, and hackberry. Some areas of Rock outcrop are inaccessible for grazing; so the plants provide moderately good habitat for quail, foxes, bobcats, coyotes, and songbirds. Some rattlesnakes are in this association.

Soil association 5 is made up mainly of the La Casa, Weymouth, and Tarrant soils. Mesquite-infested rangeland provides habitat of low quality for quail, rabbits, and songbirds.

Soil association 6 consists mainly of Badland and Rough broken land, but present also are fairly large areas of Vernon and Weymouth soils. The land types are shallow or very shallow and droughty. Forage production is limited, and overgrazing is common. Where the ground cover is sparse, trees and woody shrubs invade. These areas attract scaled quail, bobwhite quail, rabbits, deer, coyotes, and other wildlife. Steep, rough areas that have large deposits of gypsum provide a habitat for rattlesnakes.

Soil association 7 is made up of Sandy alluvial land and the Yahola soils. It adjoins the Elm, Salt, and North Forks of the Red River. Sandy alluvial land is near the stream channels and is not suitable for cultivation. It supports a good growth of tall and mid grasses intermingled with tamarisk, cottonwood, mesquite, and sand sagebrush (fig. 27). The Yahola soils adjoin Sandy alluvial land and normally are higher on the flood plain. Some areas of the Yahola soils are cultivated. These deep, permeable, occasionally flooded soils produce desirable food plants for turkeys and deer. The larger trees, such as cottonwood, are used by wild turkeys for roosting and are an important part of their habitat.

Soil association 8 is made up of the Spur and Mangum soils. Nearly all areas of the Spur soils are cultivated

[5] Prepared with the assistance of JEROME F. SYKORA, biologist, Soil Conservation Service.

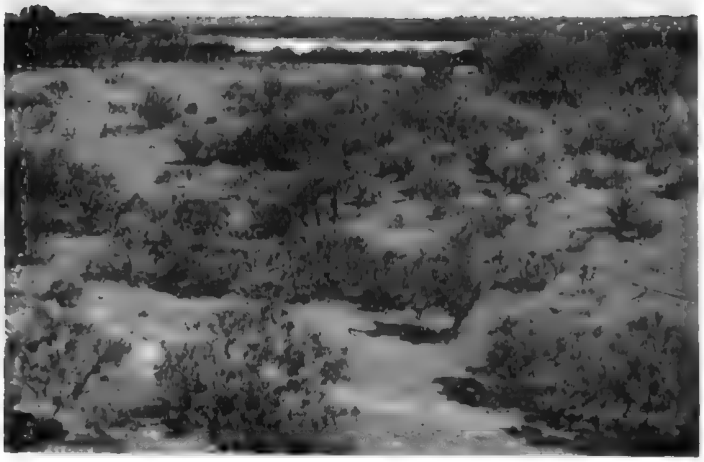

Figure 27.—Typical view of Sandy alluvial land.

to alfalfa, wheat, and cotton. The Mangum soils are mainly in native rangeland. Where fields of wheat and alfalfa adjoin large areas of rangeland covered with trees and shrubs, they are an important source of food for deer and turkeys.

Soil association 9 is made up of the Tipton and Enterprise soils. The Enterprise soils that are overgrazed are subject to invasion by sand sagebrush. Except in these areas, the soils in this association are of little use as habitat for wildlife.

Management of fish and game

Where the habitat is adequate and reproduction is normal, most kinds of game in the county are not depleted by hunting each year. Bobwhite quail is the most popular game bird. Mourning doves provide some hunting in fields of stubble and around farm ponds. Some unsuccessful attempts have been made to introduce ring-necked pheasants. Jackrabbits and coyotes are chased with greyhounds for sport. Some opossums, skunks, and minks are trapped for pelts, but the total harvest is small. The mink pelt is the most valuable fur in the county.

Releases of deer and wild turkeys have been made in the county. Some turkey hunting is permitted, but deer are protected so that their numbers will increase.

Waterfowl hunting is good, particularly on Lake Altus and in the fields of small grain that surround it.

The production of fish in farm ponds is good. Outcrops of gypsum contribute enough calcium sulfate to keep the water clear and productive. About 300 ponds, 1 acre or larger in size, have been constructed, mainly in associations 2, 5, 6, and 8. Construction on some soils is limited by the lack of a suitable site, by excessive drainage, or by the lack of sufficient rainfall to maintain the water level during months of high evaporation.

In a pond more than 1 acre in size, a combination of bass, bluegill, and channel cat generally is best for stocking. Smaller ponds should be stocked only with bass and bluegill; turbid ponds should be stocked only with channel cat. Normally, none of these fish spawn in the ponds.

Fish for stocking in farm ponds are available from the Oklahoma Wildlife Conservation Department and the Bureau of Sport Fisheries and Wildlife. Numerous bulletins, books, and other materials on the management of fish and wildlife resources are available. These can be obtained from the State Wildlife Conservation Department, the United States Fish and Wildlife Service, the State Universities, the Extension Service, the county agents, the local Soil and Water Conservation District, and the Soil Conservation Service. Individual assistance in on-site management also is available from these organizations.

Engineering Properties of the Soils [6]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. The properties most important to the engineer are permeability to water, shear strength, compaction characteristics, drainage, shrink-swell characteristics, grain size, plasticity, and pH. Depth to the water table, depth to bedrock, and topography also are important.

The information in this report can be used to—

1. Make soil and land use studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils that affect the planning of agricultural drainage and irrigation systems, farm ponds, and diversion terraces.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway, airport, pipeline, and cable locations, and in planning detailed investigations at the selected locations.
4. Locate probable sources of gravel and other highway construction materials.
5. Correlate performance of engineering structures with soils, and thus gain information that will be useful in designing and maintaining the structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps and reports and aerial photographs for the purpose of making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates pertinent to construction in a particular area.

With the use of the soil map for identification, the engineering interpretations in this section can be useful for many purposes. It should be emphasized that they may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

[6] Prepared with the assistance of HERBERT BELTER, agricultural engineer, and BOB G. DAY, civil engineer, Soil Conservation Service.

Most of the information in this section is in tables 4, 5, and 6. Table 4 shows the estimated physical properties of the soils in the county. In table 5 are interpretations of soils for engineering uses. Table 6 lists actual test data for nine soils. Additional information that is helpful to engineers can be found in the sections "Descriptions of the Soils" and "Formation, Classification, and Morphology of Soils."

Some of the terms used by soil scientists, may be unfamiliar to engineers, and other terms may have a special meaning in soil science. These terms are defined in the Glossary at the end of this report.

Engineering classification systems

Agricultural scientists classify soils according to the textural classification of the United States Department of Agriculture. Engineers generally use the Unified system developed by the Corps of Engineers[7] or the system of the American Association of State Highway Officials.[8] Table 4 shows the classification of the soils of Greer County according to all three of these systems.

In the USDA system the texture of a soil layer, or horizon, depends on the proportional amounts of sand, silt, and clay particles. Texture is closely associated with workability, fertility, permeability, erodibility, and other important characteristics of a soil. The major textural classes are defined in the Glossary.

[7] UNITED STATES ARMY, CORPS OF ENGINEERS. THE UNIFIED SOIL CLASSIFICATION SYSTEM. Tech. Memo. 3-357. 1953.

[8] AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. STANDARD SPECIFICATIONS FOR HIGHWAY MATERIALS AND METHODS OF SAMPLING AND TESTING. Ed. 8, 2 v., 401 and 617 pp. 1961.

TABLE 4.—*Estimated*

[Blank spaces mean

Soil name and symbol	Permeability	Hydrologic soil group	Depth from surface
			Inches
Abilene (AbA)	Slow	C	0 to 14
			14 to 60
Acme (AcB, part of Cw)	Moderate	B	0 to 24
			24 to 40
Altus (At, part of MuA, MuB, and Me)	Moderate	B	0 to 15
			15 to 45
			45 to 60
Badland (Ba)	Very slow	D	
Brownfield (part of MwB)	Moderate	B	0 to 18
			18 to 44
			44 to 60
Carey (CaB)	Moderate	B	0 to 12
			12 to 34
			34 to 46
Cottonwood (part of Cw)	Moderate	C	0 to 6
			6 to 10
Enterprise (EnA, EnB, EnC, EnD)	Moderately rapid	A	0 to 60
Eroded sandy land (Er)	Variable	B	(1)
Hollister (HcA)	Slow	C	0 to 15
			15 to 22
			22 to 60
La Casa (LaB)	Moderately slow	C	0 to 11
			11 to 60
Lawton (loam) (LtA, LtB, LtC2)	Moderately slow	C	0 to 9
			9 to 45
			45 to 60
Lawton (gravelly complex) (LvD)	Variable	C	(1)
Mangum (Ma)	Very slow	D	0 to 33
			33 to 52
Mansic (McA)	Moderate	C	0 to 60

See footnote at end of table.

In the Unified system the soils are grouped on the basis of their texture and plasticity and on their performance as material for engineering structures. Soil materials are identified as coarse-grained, which includes gravels (G) and sands (S); as fine grained, which includes silts (M) and clays (C); and as highly organic soils (O). In this system SW and SP are clean sands; SM and SC are sands that include fines of silt and clay; ML and CL are silts and clays that have a low liquid limit; and MH and CH are silts and clays that have a high liquid limit.

The AASHO system groups the soils according to their engineering properties as determined by their performance in highways. In this system soils are placed in seven principal groups. The groups range from A-1, consisting of gravelly soils of high bearing capacity, to A-7, consisting of clay soils that have low strength when wet. Within each group the relative engineering value of the soil material is indicated by a group index number. This number ranges from 0 for the best material to 20 for the poorest. The group index numbers for the soils that have been analyzed are shown in parentheses following the soil group symbol in the next to the last column in table 6.

Estimated engineering properties

Table 4 lists the soil series and land types in Greer County and gives estimates of some of the soil properties that effect engineering work. If test data are available, the estimates are based on such data for the modal,

engineering properties of soils

absence of data]

Classification			Percentage passing sieve—		Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 10	No. 200			
					Inches per inch of soil	*pH value*	
Clay loam	CL	A-6	100	70 to 95	0.16	6.6 to 7.3	Moderate.
Clay loam	CL	A-7	100	85 to 95	.17	6.6 to 8.4	Moderate.
Clay loam	CL	A-6	100	70 to 95	.15	7.4 to 8.4	Low to moderate.
Gypsum							
Fine sandy loam or loamy fine sand.	SM or ML	A-2 or A-4	100	20 to 40	.10	6.1 to 7.3	Low.
Sandy clay loam	SC or CL	A-4 or A-6	100	40 to 60	.12	6.6 to 7.8	Low to moderate.
Sandy clay loam	SC	A-4	100	40 to 50	.12	6.6 to 7.8	Low to moderate.
Clay	CL or CH	A-7	100	85 to 100			High.
Fine sand	SM	A-2	100	10 to 20	.05	6.1 to 7.3	Low.
Sandy clay loam	SC	A-4	100	36 to 50	.12	6.1 to 7.3	Low.
Sandy loam	SM or SC	A-2 or A-4	100	25 to 40	.12	6.6 to 7.3	Low.
Loam	ML, CL	A-4	100	55 to 85	.14	6.6 to 7.3	Low.
Clay loam	CL	A-6	100	65 to 90	.15	6.6 to 8.4	Low to moderate.
Loam	ML, CL	A-4	100	60 to 85	.14	7.9 to 8.4	Low.
Loam	ML, CL	A-4	100	55 to 85	.14	7.9 to 8.4	Low.
Gypsum							
Very fine sandy loam	ML	A-4	100	60 to 80	.14	7.4 to 8.4	Low.
(1)	(1)	(1)	(1)	(1)	(1)	(1)	
Clay loam	ML, CL	A-6	100	85 to 100	.17	6.6 to 7.8	Moderate.
Silty clay	CH	A-7	100	85 to 100	.17	7.4 to 8.4	High.
Clay loam	MH, CH	A-7	100	80 to 95	.17	7.9 to 8.4	High.
Clay loam	ML, CL	A-4	100	80 to 90	.16	6.6 to 7.8	Moderate.
Clay loam	CL	A-6 or A-7	100	85 to 95	.17	7.4 to 8.4	Moderate.
Loam	ML, CL	A-4	100	80 to 90	.14	6.1 to 7.3	Moderate.
Clay loam	CL	A-6 or A-7	100	70 to 80	.16	6.6 to 7.3	Moderate.
Clay loam	ML, CL	A-6 or A-7	100	60 to 70	.14	6.6 to 7.8	Moderate.
(1)	(1)	(1)	(1)	(1)	(1)	(1)	
Clay	CL or CH	A-7	100	95 to 100	.17	7.4 to 8.4	High.
Clay loam	CL	A-6	100	80 to 95	.17	7.9 to 8.4	High to moderate.
Clay loam	CL	A-6	100	65 to 80	.15	7.4 to 8.4	Moderate.

TABLE 4.—*Estimated engineering*

Soil name and symbol	Permeability	Hydrologic soil group	Depth from surface
			Inches
Meno (part of Me)	Moderately slow	B	0 to 18 18 to 39 39 to 60
Miles (MfC, MfC2, part of MuA and MuB, and part of MwB)	Moderate	B	0 to 14 14 to 35 35 to 45
Nobscot (NoC, NoD)	Moderately rapid	A	0 to 19 19 to 41 41 to 60
Quinlan (QaF, part of QwC2 and QwE, and part of WwC)	Moderate	B	0 to 13 13
Rock outcrop (Rc)	Variable	D	(1)
Rough broken land (Rk)	Variable	D	(1)
Sandy alluvial land (Sa)	Moderately rapid	B	0 to 7 7 to 50
Sandy broken land (Sb)	Variable	C	(1)
Springer (SgB, SgD)	Moderately rapid	A	0 to 19 19 to 33 33 to 50
Spur (clay loam) (Sm)	Moderately slow	B	0 to 50
Spur (loam) (Sn)	Moderate	B	0 to 55
Spur (undifferentiated) (So)	Variable	C	(1)
St. Paul (SpA, SpB)	Moderately slow	C	0 to 12 12 to 48 48 to 60
Tarrant (part of WmC)	Moderate	D	0 to 6 6
Tillman (TcA, TcB)	Very slow	D	0 to 15 15 to 45
Tipton (TpA, TpB)	Moderate	B	0 to 18 18 to 39 39 to 60
Tivoli (Tv, Tw)	Rapid	A	0 to 7 7 to 60
Treadway (Ty)	Very slow	D	0 to 50
Vernon (VeE, part of VwF)	Very slow	D	0 to 6 6 to 16
Wet alluvial land (Wa)	Variable	B	(1)
Weymouth (WeB, WeC, WeC2, part of WmC, and part of VwF)	Moderately slow	C	0 to 50
Woodward (WoB, WoC, part of QwC2 and QwE, and part of WwC)	Moderate	B	0 to 40
Yahola (Ya)	Moderately rapid	B	0 to 36 36 to 60

[1] Properties are variable.

properties of soils—Continued

Classification			Percentage passing sieve—		Available water capacity	Reaction	Shrink-swell potential
USDA texture	Unified	AASHO	No. 10	No. 200			
					Inches per inch of soil	*pH value*	
Loamy fine sand	SM	A-2	100	15 to 25	.07	6.1 to 7.3	Low.
Sandy clay loam	SC	A-4	100	36 to 50	.12	6.1 to 7.3	Low.
Clay loam	CL	A-6	100	60 to 70	.17	6.6 to 7.8	Moderate.
Fine sandy loam and loamy fine sand.	SM	A-2 or A-4	100	20 to 35	.10	6.1 to 7.3	Low.
Sandy clay loam	CL or ML	A-4	100	51 to 60	.12	6.6 to 7.8	Low.
Sandy loam	SM or SC	A-4 or A-2	100	30 to 50	.12	6.6 to 8.4	Low.
Fine sand	SM	A-2	100	11 to 20	.05	5.6 to 7.3	Low.
Sandy loam	SM	A-2 or A-4	100	25 to 40	.12	5.6 to 7.3	Low.
Loamy fine sand	SM	A-2	100	15 to 25	.07	6.1 to 7.8	Low.
Loam	ML or CL	A-4	100	55 to 85	.14	7.4 to 8.4	Low.
Sandstone							
(1)	(1)	(1)	(1)	(1)	(1)	(1)	
(1)	(1)	(1)	(1)	(1)	(1)	(1)	
Loamy fine sand	SM	A-2	100	15 to 35	.07	7.4 to 8.4	Low.
Fine sand	SP-SM	A-3	100	10 to 20	.05	7.4 to 8.4	Low.
(1)	(1)	(1)	(1)	(1)	(1)	(1)	
Loamy fine sand	SM	A-2	100	15 to 25	.07	6.1 to 7.3	Low.
Sandy loam	SM or SC	A-2 or A-4	100	30 to 50	.14	6.6 to 7.3	Low.
Loamy sand	SM	A-2 or A-4	100	30 to 40	.10	6.6 to 7.3	Low.
Clay loam	CL	A-6	100	80 to 95	.17	7.4 to 8.4	Moderate.
Loam	CL or ML	A-4	100	70 to 85	.14	7.4 to 8.4	Moderate to low.
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1).
Silt loam	ML-CL	A-4	100	75 to 90	.14	6.6 to 7.8	Moderate.
Silty clay loam	CL	A-6	100	85 to 95	.17	6.6 to 8.4	Moderate.
Clay loam	CL	A-6	100	75 to 95	.17	7.9 to 8.4	Moderate.
Loam	ML or CL	A-4	100	55 to 85	.14	7.4 to 8.4	Moderate.
Dolomitic limestone							
Clay loam	CL	A-6	100	75 to 95	.17	7.4 to 8.4	Moderate.
Clay	CL or CH	A-7	100	80 to 95	.17	7.4 to 8.4	High.
Loam	CL or ML	A-4	100	60 to 85	.14	6.6 to 7.8	Low.
Clay loam	CL or ML	A-6	100	70 to 90	.16	7.4 to 8.4	Moderate.
Sandy clay loam	SC or CL	A-4	100	40 to 60	.14	7.4 to 8.4	Low.
Fine sand and loamy fine sand.	SP or SM	A-3 or A-2	100	5 to 20	.05	6.1 to 7.8	Low.
Fine sand	SP-SM	A-3	100	5 to 10	.05	6.6 to 7.8	Low.
Clay or clay loam	CL-CH	A-7	100	80 to 95	17-.14	7.9 to 8.4	High.
Clay or clay loam	CL or CH	A-6 or A-7	100	75 to 95	.17	7.9 to 8.4	Moderate to high.
Clay	CL or CH	A-7	100	90 to 100	.17	7.9 to 8.4	High.
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1).
Clay loam	ML-CL	A-6	100	75 to 95	.17	7.9 to 8.4	Moderate.
Loam	ML or CL	A-4	100	55 to 85	.14	7.4 to 8.4	Moderate.
Fine sandy loam	SM	A-4	100	36 to 50	.12	7.4 to 8.4	Low.
Loamy fine sand	SM	A-2 or A-4	100	20 to 40	.07	7.4 to 8.4	Low.

TABLE 5.—*Interpretation of engineering*

Soil name and symbol	Suitability and limitations as source of—			Soil features affecting engineering practices for—
	Topsoil	Select grading material	Road fill	Highway location
Abilene (AbA)	Surface layer good; other layers fair or poor.	Unsuitable	Fair or poor; clayey material.	Clayey material; moderate shrink-swell potential.
Acme (AcB)	Surface layer good; other layers poor.	Unsuitable	Poor; loamy soils over bedrock at depth of about 3 feet.	Gypsum at depth of about 3 feet.
Altus (At, part of MuA and MuB).	Surface layer good; other layers fair.	Good; subsoil may be too clayey.	Good	Seasonal high water table.
Badland (Ba)	Unsuitable; too plastic.	Unsuitable; highly plastic material.	Poor; highly plastic material.	Highly plastic soil material; rough topography.
Carey (CaB)	Good	Poor or unsuitable	Good	Features favorable
Cottonwood-Acme (complex) (Cw).	Poor; limited material.	Unsuitable; shallow over gypsum.	Poor; shallow over gypsum.	Gypsum at depth of 1 to 3 feet.
Enterprise (EnA, EnB, EnC, EnD).	Good or fair	Good	Good	Features favorable
Eroded sandy land (Er)	Poor; limited material.	Fair; variable physical properties.	Good	Subject to severe erosion in cuts.
Hollister (HcA)	Poor; limited material over clay.	Unsuitable; highly plastic material.	Poor; high shrink-swell potential; unstable when wet.	High shrink-swell potential; unstable when wet.
La Casa (LaB)	Good or fair; subsurface material may be too clayey.	Unsuitable	Surface layer fair; other layers poor.	Moderate shrink-swell potential; unstable when wet.
Lawton (loam) (LtA, LtB, LtC2).	Surface layer good; other layers fair or poor; contains gravel beds.	Fair or poor; plastic and stony.	Surface layer good; other layers fair or poor.	Features favorable
Lawton (gravelly complex) (LvD).	Surface layer fair; other layers unsuitable because of stones.	Unsuitable; too stony	Good; granitic substratum may need binder.	Some granitic rocks and boulders on sloping to strongly sloping uplands.
Mangum (Ma)	Poor; too plastic	Unsuitable; highly plastic material.	Poor; highly plastic material.	Subject to occasional overflow; high shrink-swell potential; unstable when wet.
Mansic (McA)	Good	Unsuitable; too plastic	Fair; moderate shrink-swell potential.	Features favorable
Meno and Altus (Me)	Poor; surface material coarse and easily eroded.	Good	Good or fair; seasonal water table.	Seasonal high water table.

properties of soils

Soil features affecting engineering practices for—Continued				
Farm ponds		Irrigation	Terraces and diversions	Waterways
Reservoir area	Embankment			
Little natural storage	Fairly stable; subject to cracking.	Features favorable	Stable fill; slowly permeable subsoil.	Fertile; slight water erosion hazard; droughty.
Possibility of gyp sinks; bedrock at depth of about 3 feet.	Unstable because of large amount of gypsum.	Limited root zone; limited water-holding capacity.	Features favorable	Moderately fertile; water erosion hazard.
Little natural storage; moderate seepage.	Stable fill when well compacted; erosion hazard.	Wind erosion hazard	Stable fill; wind erosion hazard.	Fertile; wind erosion hazard.
Low seepage; occasional thin layers of gypsum.	High shrink-swell potential; erosion hazard.	Nonarable	Nonarable	Nonarable.
Moderate permeability and seepage.	Stable fill	Features favorable	Features favorable	Fertile; water erosion hazard.
Gypsum near the surface	Unsuitable because of large amount of gypsum.	Nonarable	Nonarable	Nonarable.
Moderate seepage	Stable fill; severe erosion hazard.	Milder slopes suitable for flooding; slopes of 3 percent or more suitable only for sprinkler irrigation.	Wind and water erosion hazard.	Fertile; erodible.
Moderate to low seepage	Stable fill; erosion hazard	Nonarable	Water and wind erosion hazard; suitable for diversion terraces if seeded to grass.	Low fertility; high erosion hazard.
Little natural storage; low seepage.	Unstable for high fill	Slow intake rate	Slowly permeable subsoil	Good fertility; level topography; droughty.
Little natural storage; low seepage.	High shrink-swell potential; low seepage.	Features favorable	Moderately slow permeability in subsoil.	Fertile; gently sloping topography; droughty.
Little natural storage; moderate seepage; gravel beds generally at depth below 5 feet.	Stable fill if well compacted.	Milder slopes suitable for flooding; slopes of 3 percent or more suitable only for sprinkler irrigation.	Moderately slow permeability in subsoil.	Fertile; erosion hazard.
Moderate seepage; gravel beds or stones occur in substratum.	Stable fill if well compacted, but may leak.	Nonarable	Nonarable; rock outcrops; suitable for diversion terraces if seeded to grass.	Nonarable.
Little natural storage; level topography.	High shrink-swell potential; difficult to compact; unstable.	Very slow intake rate; overflow hazard.	Stable fill; high shrink-swell potential.	High shrink-swell potential; droughty.
Little natural storage; moderate to low seepage.	Stable fill	Features favorable	Stable fill; moderately resistant to erosion.	Fertile; level topography.
Little natural storage; moderate to low seepage.	Stable fill if well compacted and if erosion is controlled.	Wind erosion hazard; high intake rate; suitable for sprinkler irrigation.	Severe wind erosion hazard; suitable for diversion terraces if seeded to grass.	Severe wind erosion hazard.

TABLE 5.—*Interpretation of engineering*

Soil name and symbol	Suitability and limitations as source of— Topsoil	Select grading material	Road fill	Soil features affecting engineering practices for— Highway location
Miles (MfC, MfC2, part of MuA and MuB).	Fair or poor; easily eroded in sloping areas.	Good	Good	Features favorable
Miles and Brownfield (MwB).	Poor; surface material coarse and easily eroded.	Good	Good	Subject to severe wind erosion.
Nobscot (NoC, NoD)	Poor; material coarse and easily eroded.	Good	Good when slopes are stabilized.	Subject to severe wind erosion.
Quinlan (QaF)	Good or fair; limited material.	Fair above sandstone	Fair; sandstone at depth of about 1 to 2 feet.	Sandstone at depth of about 1 to 2 feet.
Quinlan-Woodward (QwC2, QwE).	Good or fair; limited material.	Fair above sandstone	Fair; sandstone at depth of about 1 to 3 feet.	Sandstone at depth of about 1 to 4 feet.
Rock outcrop (Rc)	Unsuitable; too stony	Unsuitable; too stony	Poor; too stony	Rough, stony topography
Rough broken land (Rk)	Unsuitable; too plastic.	Unsuitable; highly plastic material.	Poor; highly plastic material.	Steep, rough topography
Sandy alluvial land (Sa)	Poor; coarse material	Good; except for clayey surface layer.	Good when slopes are stabilized.	Subject to flooding; high water table at depth of 6 to 10 feet.
Sandy broken land (Sb)	Fair; mixed deposits; some gravel.	Fair; mixed deposits	Fair; mixed deposits	Rough, broken topography.
Springer (SgB, SgD)	Poor; surface layer coarse textured and easily eroded.	Good	Good; slopes need to be stabilized.	Subject to wind erosion
Spur (clay loam) (Sm)	Good	Fair or unsuitable	Good or fair; clay loam; plastic material.	Subject to occasional overflow.
Spur (loam) (Sn)	Good	Fair	Good	Subject to occasional overflow.
Spur (undifferentiated) (So).	Fair or poor; mixed deposits.	Unsuitable; variable physical properties.	Good or fair	Subject to frequent overflow.
St. Paul (SpA, SpB)	Good	Poor or unsuitable; too plastic.	Surface layer good or fair; other layers poor; too clayey.	Features favorable
Tillman (TcA, TcB)	Poor; some suitable material over clay.	Unsuitable; highly plastic material.	Poor; highly plastic material.	Highly plastic soils; slow internal drainage.
Tipton (TpA, TpB)	Good	Fair or poor	Good	Features favorable

properties of soils—Continued

Soil features affecting engineering practices for—Continued				
Farm ponds		Irrigation	Terraces and diversions	Waterways
Reservoir area	Embankment			
Little natural storage; moderate seepage.	Stable fill if well compacted; erosion hazard.	Wind erosion hazard; high intake rate; slopes of 3 percent or more not suitable for flood irrigation.	Stable fill; wind erosion hazard.	Fertile; wind erosion hazard.
Little natural storage; moderate seepage.	Stable fill if well compacted and if erosion is controlled.	Wind erosion hazard; high intake rate; suitable for sprinkler irrigation.	Severe wind erosion hazard; suitable for diversion terraces if seeded to grass.	High wind erosion hazard.
High seepage	Moderate to high seepage.	Low water-holding capacity; high intake rate; milder slopes suitable for sprinkler irrigation; slopes of 5 percent or more nonarable.	Severe wind erosion hazard; suitable for diversion terraces if seeded to grass; slopes of 5 percent or more nonarable.	Very low fertility; wind erosion hazard; slopes of 5 percent or more nonarable.
Sandstone at depth of about 1 to 2 feet.	Subject to piping; mostly sandstone.	Nonarable	Shallow over bedrock; nonarable.	Nonarable.
Sandstone at depth of about 1 to 4 feet.	Subject to piping; limited borrow material.	Limited root zone; sloping; steeper slopes nonarable.	Features favorable	Easily eroded.
Too rocky	Limited material	Nonarable	Large amount of rock outcrops; nonarable.	Nonarable
Low seepage	Impervious; difficult to compact; steep slopes.	Nonarable	Shallow over bedrock; steep slopes; nonarable.	Nonarable.
High seepage; sand at depth of 1 to 2 feet.	High seepage; slopes easily eroded.	Nonarable	Susceptible to frequent flooding; nonarable.	Nonarable.
High seepage; contains some gravel.	Fairly stable; erosion hazard.	Nonarable	Highly susceptible to gully erosion; nonarable.	Nonarable.
High seepage	Stable fill if well compacted and if erosion is controlled; seepage potential.	High intake rate; low water-holding capacity; suitable for sprinkler irrigation.	Severe wind erosion hazard; suitable for diversion terraces if seeded to grass.	Low fertility; severe wind erosion hazard.
Level topography	Stable fill if well compacted.	Features favorable, except for occasional overflow.	Level topography	Deep; fertile; level topography.
Level topography	Stable fill	Features favorable, except for occasional overflow.	Level topography	Deep; fertile; level topography.
Little natural storage; low seepage.	Features favorable	Nonarable	Susceptible to frequent flooding; nonarable.	Nonarable.
Little natural storage	Features favorable	Features favorable	Features favorable	Fertile; slight water erosion hazard.
Little natural storage	High shrink-swell potential; difficult to to compact.	Very slow intake rate	Very slowly permeable subsoil.	Droughty; slight water erosion hazard.
Moderate seepage; level topography.	Features favorable	Favorable water-holding capacity; moderate intake rate.	Features favorable	Deep; fertile.

TABLE 5.—*Interpretation of engineering*

Soil name and symbol	Suitability and limitations as source of— Topsoil	Select grading material	Road fill	Soil features affecting engineering practices for— Highway location
Tivoli (Tv, Tw)	Unsuitable; material too coarse.	Good	Good	Duny and hummocky sands; highly erodible.
Treadway (Ty)	Unsuitable; material too plastic.	Unsuitable; highly plastic material.	Poor; highly plastic material.	High shrink-swell potential; slightly saline.
Vernon (VeE)	Poor; too plastic; limited material.	Unsuitable; highly plastic material.	Poor; highly plastic material.	High shrink-swell potential.
Vernon-Weymouth (VwF)	Poor; limited material.	Unsuitable; too plastic	Fair or poor; too stony; highly plastic material.	Rough topography; bedrock at depths ranging from less than 1 foot to 8 feet.
Wet alluvial land (Wa)	Fair or poor; high water table.	Fair or poor; variable profile characteristics.	Fair; high water table	Seasonal high water table; subject to frequent overflow.
Weymouth (WeB, WeC, WeC2).	Good or fair; limited material.	Unsuitable	Fair	Features favorable
Weymouth-Tarrant (WmC).	Poor; too stony	Unsuitable	Poor; shallow over bedrock.	Underlain by dolomitic limestone at depth of 4 inches to 6 feet.
Woodward (WoB, WcC)	Good or fair	Fair; elastic	Good or fair; moderately deep over fine-grained sandstone.	Features favorable
Woodward-Quinlan (WwC).	Good or fair; limited material.	Fair above sandstone	Fair; sandstone at depth of about 1 to 4 feet.	Sandstone at depth of about 1 to 4 feet.
Yahola (Ya)	Good or fair; substratum unsuitable; too sandy.	Good	Good	Subject to occasional overflow.

TABLE 6.—*Engineering test data for*

[Tests performed by the Oklahoma Department of Highways in accordance with

Soil name and location	Parent material	Oklahoma report No.	Depth	Horizon	Shrinkage Limit	Shrinkage Ratio	Volume change from field moisture equivalent
Abilene clay loam: NW¼NW¼ sec. 3, T. 6 N., R. 22 W. (Modal)	Old alluvium.	SO-5614	*Inches* 5-11	A1	16	1. 82	*Percent* 27
		SO-5615	16-28	B2t	12	1. 96	55
		SO-5616	46-60	C	11	2. 01	60

See footnotes at end of table.

properties of soils—Continued

Soil features affecting engineering practices for—Continued				
Farm ponds		Irrigation	Terraces and diversions	Waterways
Reservoir area	Embankment			
High seepage	Erodible; stable fill if used with flat slopes and sodding; high seepage.	Nonarable	Too sandy; nonarable	Unstable sands; low fertility; nonarable.
Little natural storage	Difficult to compact; high shrink-swell potential.	Nonarable	High shrink-swell potential; nonarable.	Low fertility; droughty; nonarable.
Little natural storage; low seepage.	Difficult to compact; high shrink-swell potential.	Nonarable	Stable fill; high shrink-swell potential; nonarable.	Low fertility; droughty; nonarable.
Low seepage; some layers of gypsum.	Subject to cracking, piping, and erosion.	Nonarable	Shallow over bedrock; nonarable.	Nonarable.
Level topography	Stable fill when compacted.	Nonarable	High water table; nonarable.	Fertile; subject to deposition by overflow; nonarable.
Low seepage	Stable fill; moderate shrink-swell potential.	Features favorable; slopes of 3 percent or more not suitable for flood irrigation.	Stable fill; moderate shrink-swell potential.	Moderately fertile; water erosion hazard.
Bedrock at depth of 4 inches to 6 feet.	Limited borrow material; shallow over bedrock.	Nonarable	Shallow over rock; nonarable.	Nonarable.
Moderate seepage; limited depth to sandstone.	Fairly stable; subject to water erosion.	Limited root zone; slopes of 3 percent or more not suitable for flood irrigation.	Features favorable	Moderately fertile; water erosion hazard.
Sandstone at depth of about 1 to 4 feet.	Subject to piping; limited borrow material.	Moderate intake rate; limited root zone; suitable for sprinkler irrigation.	Features favorable	Erosion hazard.
High to moderate seepage; little natural storage.	High to moderate seepage.	High to moderate intake rate; moderate to low water-holding capacity.	Susceptible to occasional overflow; level topography.	Moderately fertile; wind erosion hazard.

soil samples taken from nine soil profiles

standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [1]								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than—					AASHO [2]	Unified [3]
¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.002 mm.				
			100	96	89	32	28	33	11	A-6(8)	ML-CL.
			100	92	86	42	38	47	25	A-7-6(15)	CL.
		100	99	92	83	42	38	46	24	A-7-6(15)	CL.

TABLE 6.—*Engineering test data for soil*

Soil name and location	Parent material	Oklahoma report No.	Depth	Horizon	Shrinkage		Volume change from field moisture equivalent
					Limit	Ratio	
			Inches				*Percent*
Hollister clay loam: SE¼SE¼NE¼ sec. 14, T. 3 N., R. 22 W. (Modal)	Old alluvium (terraces).	SO-5602	0-5	Ap	13	1.92	44
		SO-5603	14-30	B2t	11	2.04	60
		SO-5604	42-60	C	13	1.91	57
La Casa clay loam: SW¼SE¼SE¼ sec. 11, T. 3 N., R. 23 W. (Modal)	Clayey Permian red beds.	SO-5605	0-5	Ap	15	1.88	28
		SO-5606	14-41	B2t	12	1.97	53
		SO-5607	41-60	C	13	1.95	46
Lawton loam: SW¼NW¼SW¼ sec. 30, T. 6 N., R. 20 W. (Modal)	Old gravelly alluvium.	SO-5611	0-6	Ap	17	1.79	10
		SO-5612	14-35	B2t	12	1.97	40
		SO-5613	45-60	C	12	1.96	44
Miles fine sandy loam: SW¼SW¼NE¼ sec. 25, T. 5 N., R. 22 W. (Modal)	Old sandy alluvium.	SO-5623	0-14	Ap	13	1.91	8
		SO-5624	14-28	B2t	14	1.87	20
		SO-5625	28-45	C	15	1.83	12
Mangum clay: NW¼NW¼NE¼ sec. 25, T. 7 N., R. 23 W. (Modal)	Recent alluvium from clayey Permian red beds.	SO-5608	0-8	A1	17	1.79	44
		SO-5609	8-33	AC	15	1.86	32
		SO-5610	33-52	C	13	1.93	23
Springer loamy fine sand: SE¼SW¼SW¼ sec. 21, T. 5 N., R. 21 W. (Modal)	Old alluvium reworked by wind.	SO-5617	8-19	A1	(5)	(5)	(5)
		SO-5618	19-33	B2t	15	1.82	13
		SO-5619	33-50	C	14	1.84	7
Tillman clay loam: SE¼SW¼SW¼ sec. 11, T. 4 N., R. 21 W. (Modal)	Clayey Permian red beds.	SO-5599	0-4	Ap	13	1.94	41
		SO-5600	15-32	B2t	11	2.04	57
		SO-5601	32-45	C	11	1.99	49
Weymouth clay loam: NW¼SW¼NW¼ sec. 24, T. 5 N., R. 23 W. (Modal)	Clayey Permian red beds.	SO-5620	0-11	A1	16	1.79	30
		SO-5621	11-21	AC	15	1.86	36
		SO-5622	21-50	Cca	11	2.03	37

[1] According to Designation T 88-57, "Mechanical Analysis of Soils," in "Standard Specifications for Highway Materials and Methods of Sampling and Testing," pt. 2, Ed. 8 (1961) published by AASHO. Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for use in naming textural classes for soils.

or typical, profile. If no test data are available, the estimates are based on test data for similar soils in this county or in other counties and on experience in engineering construction. Because the estimates are only for the modal soils, considerable variation from these values should be anticipated. A more complete description of each soil can be found in the section "Detailed Descriptions of Soil Series," beginning on page 58.

Permeability refers only to the movement of water downward through undisturbed material. It was estimated for the soils as they occur in place and was based on soil structure and porosity. Not considered, however, are plowpans, surface crusting, and other mechanically developed features. The equivalents of the adjective ratings in inches per hour are as follows: *very slow*, less than 0.05; *slow*, 0.05 to 0.20; *moderately slow*, 0.20 to 0.80; *moderate*, 0.80 to 2.50; *moderately rapid*, 2.50 to 5.00; and *rapid*, 5.00 to 10.00.

Ratings in the column "Hydrologic soil group" are based on the entire soil profile to the depth shown in the column "Depth from surface." The soils in the county are placed in four groups on the basis of their intake of water at the end of a long-duration storm, after prior wetting and swelling and without the protection of vegetation. Group A consists mostly of sandy soils that have the lowest runoff potential. Group D consists mostly of clays that have the highest runoff potential.

In the column "Depth from surface" is shown the thickness of layers in a typical profile. Each of these layers is then classified in terms used by the United States Department of Agriculture and those of the

samples taken from nine soil profiles—Continued

Mechanical analysis [1]								Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than—					AASHO [2]	Unified [3]
¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.005 mm.	0.002 mm.				
			100	96	90	48	41	39	15	A-6(10)	ML-CL.
		100	99	96	91	54	49	53	28	A-7-6(18)	CH.
		100	99	89	(4)	(4)	(4)	56	28	A-7-6(18)	MH-CH.
		100	99	84	72	30	27	31	10	A-4(8)	ML-CL.
		100	98	90	84	41	38	41	18	A-7-6(11)	CL.
100	99	98	97	89	80	41	38	42	19	A-7-6(12)	CL.
		100	98	85	75	20	18	25	6	A-4(8)	ML-CL.
100	99	98	95	86	80	43	38	40	24	A-6(14)	CL.
100	93	84	74	63	53	34	32	39	15	A-6(8)	ML-CL.
		100	88	32	21	14	13	18	2	A-2(0)	SM.
		100	95	55	39	22	21	26	8	A-4(4)	ML-CL.
		100	97	46	31	19	17	24	6	A-4(2)	SM-SC.
			100	99	97	70	58	50	21	A-7-6(14)	ML-CL.
				100	97	66	55	44	20	A-7-6(13)	CL.
			100	92	83	42	36	28	11	A-6(8)	CL.
		100	87	18	12	7	5	(5)	(5)	A-2-3(0)	SM.
		100	98	35	28	18	18	23	6	A-2-4(0)	SM-SC.
		100	95	35	22	15	14	20	3	A-2(0)	SM.
100	99	98	96	86	79	38	34	38	16	A-6(10)	CL.
100	99	96	91	84	76	47	43	47	23	A-7-6(15)	CL.
100	99	98	94	91	87	59	50	46	23	A 7-6(14)	CL.
		100	99	90	80	31	26	35	12	A-6(9)	ML-CL.
		100	99	91	80	37	31	37	13	A-6(9)	ML-CL.
		100	99	93	81	43	33	32	14	A-6(10)	CL.

[2] Oklahoma Department of Highways classification procedure subdivides the AASHO A-2-4 subgroup into the following: A-2-3(0) when PI=nonplastic; A-2(0) when PI=NP to 5; and A-2-4(0) when PI=5 to 10.
[3] All soils having plasticity indexes within 2 points of the A-line are given a borderline classification. Examples of borderline classifications obtained by this use are ML-CL, MH-CH, and SM-SC.
[4] Hydrometer analysis could not be performed because of the presence of gypsum.
[5] Nonplastic.

Unified system and of the system used by the American Association of State Highway Officials. Each column under "Percentage passing sieve—" lists the percentage of soil material that is smaller in diameter than the openings of the given screen.

The available water capacity is the approximate amount of capillary water in the soil when the soil is wet to field capacity. When the soil moisture is at the wilting point, this amount of water will wet the soil material to a depth of 1 inch without deeper percolation.

Soil reaction is a term used in expressing the degree of acidity or alkalinity of a soil. The pH is the mathematical expression of the relative degree of acidity.

The shrink-swell potential is an indication of the volume change to be expected of the soil material with changes in moisture content. This potential is based on volume-change tests or on observance of other physical properties or characteristics of the soil. For example, Mangum clay is very sticky when wet and develops extensive shrinkage cracks as it dries. The shrink-swell potential of this soil, therefore, is high. In contrast, Nobscot fine sand, 0 to 5 percent slopes, is structureless and nonplastic and has low shrink-swell potential.

Engineering interpretations of soils

Table 5 shows specific features of the soils that affect their use for engineering purposes. These features may affect the selection of a site, and they may affect the design of a structure or the application of measures that make the soil suitable for construction. The data in this table are based on estimated data given in table 4, on actual test data given in table 6, and on field expe-

rience. In the first part of table 5, the soils are rated according to their suitability and limitations as a source of topsoil, select grading material, and road fill. The last part of the table lists features that affect selected engineering practices.

Normally, only the surface layer of a soil is rated as a source of topsoil, and the suitability of this material depends largely upon texture and depth. The material must be thick enough and friable enough to be worked into a good seedbed for seeding or sodding, yet clayey enough to resist erosion on steep slopes.

The suitability of a soil for select grading material depends primarily upon the grain size and the amount of silt and clay. Soils that consist mainly of sands are good if a binder is added for cohesion. Clay soils compress under load and rebound when the load is removed and for these reasons are rated unsuitable.

Although every kind of soil material is used as road fill, some soils, such as sandy clays and sandy clay loams, offer few problems in placement or compaction. Clays that have high shrink-swell potential require special compaction techniques and close moisture control, both during and after construction. Sands compact well but are difficult to confine. The ratings shown in table 5 reflect the relative difficulty of overcoming these problems.

In this county the major sources of commercial sand are Nobscot fine sand, Tivoli fine sand, Tivoli loamy fine sand, Yahola fine sandy loam, Sandy alluvial land, and Sandy broken land. The major sources of gravel are Lawton loam, Lawton gravelly complex, Sandy alluvial land, and Sandy broken land.

In the eastern part of the county, Lawton loam and Lawton gravelly complex generally are underlain by granitic gravel, which is used extensively for surfacing county roads.

Soil test data

Table 6 contains test data for soil samples collected during the soil survey of the county and tested by the Oklahoma Department of Highways. Only selected soils were sampled. Test data for other soils may be found in other published soil survey reports. Some of the terms used in table 6 are explained in the following paragraphs.

As moisture leaves a soil, the soil decreases in volume in proportion to the loss in moisture, until a point is reached where shrinkage stops even though additional moisture is removed. The moisture content at which shrinkage stops is called the shrinkage limit. The shrinkage limit of a soil is a general indication of the clay content; it decreases as the clay content increases. In sand that contains little or no clay, the shrinkage limit is close to the liquid limit and is considered insignificant. As a rule, the load-carrying capacity of a soil is at a maximum when its moisture content is at or below the shrinkage limit. Sand does not follow this rule, because if it is confined, its load-carrying capacity is uniform within a considerable range in moisture content.

The shrinkage ratio is the volume change resulting from the drying of a soil material, divided by the loss of moisture caused by drying. The ratio is expressed numerically. The volume change used in computing shrinkage ratio is the change in volume that takes place in a soil when it dries from a given moisture content to a point where no further shrinkage takes place.

The volume change when the moisture content is reduced from the field moisture equivalent to the shrinkage limit is expressed in table 6 as a percentage of the dry volume of the soil mass. The field moisture equivalent (FME) is the minimum moisture content at which a smooth soil surface will absorb no more water in 30 seconds when the water is added in individual drops. It is the moisture content required to fill all the pores in sands and to approach saturation in cohesive soils.

In mechanical analysis the soil components are sorted by particle size. Sand and other granular material are retained on a No. 200 sieve, but finer particles pass through the openings. Clay is the fraction smaller than 0.002 millimeter in diameter. The material intermediate in size between that held on the No. 200 sieve and that having a diameter of 0.002 millimeter is mostly silt.

The tests for liquid limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material changes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Formation, Classification, and Morphology of Soils

In this section the formation of the soils of Greer County is discussed and the outstanding morphological characteristics of the soils and their relationship to the factors of soil formation are given. Also discussed is the classification of the soils by higher categories.

Factors of Soil Formation

Soil is formed by weathering and other processes that act on material deposited or accumulated by geologic agencies. The characteristics of a soil at any given point depend on (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the factors of soil formation have acted on the soil material.

Climate and plant and animal life are the active factors of soil formation. They act on the parent material accumulated through the weathering of rocks and slowly change it into a natural body with genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of profile that can be formed and in extreme cases determines most of the characteristics. Finally, time is needed for the changing of the parent

material into a soil profile. The amount of time may be much or little, but generally a long time is required for distinct horizons to develop.

The factors of soil genesis are so closely interrelated in their effects on the soil that few generalizations can be made about the effect of any one factor unless conditions are specified for the other four.

Parent material

The soils of Greer County formed from several different kinds of parent material. These materials are shown in table 7, p. 57.

Climate

The climate of Greer County is continental. It is characterized by hot, generally dry summers; moderate fall and winter seasons, during which the precipitation is light; and windy springs, during which the rainfall is heavier than at any other season. Because of the strong winds and hot weather, the rate of evaporation is high and little water moves downward through the soils. Consequently, the basic elements generally are not leached out. A calcium carbonate zone in many soils suggests the average depth to which water moves. Calcium carbonate, which is a common base and one of the more easily leached, dissolves in water and is carried downward during soil formation. The depth to a calcium carbonate zone ranges from a few inches in soils such as Woodward loam, 1 to 3 percent slopes, to several feet in soils such as St. Paul silt loam, 1 to 3 percent slopes. Nobscot fine sand, 0 to 5 percent slopes, does not have a distinct zone of calcium carbonate. Some soils that developed in highly calcareous material, such as Weymouth clay loam, 3 to 5 percent slopes, are calcareous in the surface layer.

Climate causes some of the variations in plant and animal life and thus modifies the effect of living organisms on soils.

Plant and animal life

Many species of plants and animals, both on and in the soil, are active in soil-forming processes. The two chief functions of plants and animals, so far as soil formation is concerned, are the furnishing of organic matter for the soil and the bringing up of plant nutrients from the lower layers to the upper ones.

The primary source of organic matter is the vegetation that develops on the soil and modifies the color of practically all soils. Grasses and trees drop their dead leaves and stems, and these furnish a large amount of organic material over a long period. Roots penetrate the soil and influence its structure and physical condition. The roots also help to keep the soil supplied with minerals by bringing elements from the parent material to the surface layer in a form that plants can use.

As plants die, their tissues are decomposed by soil organisms and thereby add organic matter. Bacteria, fungi, and other micro-organisms are responsible for the decay of plant tissues, the liberation of plant nutrients, denitrification, and the fixation of humus and nitrogen

Since soil organisms thrive in a moist, moderately warm environment, they are most active late in spring and early in fall. Plant remains decompose slowly during the hot, dry summer.

Relief

Relief, or the lay of the land, affects the formation of soils through its effect on runoff and drainage. In Greer County relief ranges from nearly level to steep.

Runoff is rapid in steep areas, for example, in areas of Rough broken land. As a consequence, geologic erosion almost keeps pace with the weathering of rock and the formation of soil. Water runs slowly off nearly level areas, such as those occupied by Hollister clay loam, 0 to 1 percent slopes, and the soils are better developed.

In soil formation, relief commonly is a local factor rather than a regional one. Thus, the influence of relief is more likely to be reflected in differences among soils within a given landscape than among soils of different regions.

Time

The length of time that the soils in this county have been forming is reflected in the degree of horizon development.

The age of a soil is not the same as the geologic age of the parent material. Although the sediments that were formed into rocks of the Permian system were deposited in sea bottoms 200 million years ago, the landscape on which the soils began to form did not develop until much later.

It is difficult to determine the time factor of soil formation or the age of a soil in terms of years, for the reason that other soil-forming factors may accelerate or retard the formation. The soils of Greer County range in age from young to old. They vary not only in actual years of age but also in degree of development. If the soil-forming factors have not been active long enough to form definite genetic horizons, the soils are youthful or immature, like those of the Yahola series. Soils of the Abilene series, which have clearly expressed horizons, are mature.

Classification and Morphology of Soils

Soils are classified in various categories to make it easier to remember them and to organize and apply knowledge about their behavior to farms, ranches, counties, or continents. The system of soil classification used in the United States has six categories.[9] Beginning with the most inclusive, these six categories are the order, suborder, great soil group, family, series, and type.

The categories of the suborder and family have never been fully developed and, therefore, have been little used. In soil classification attention has largely been given to the recognition of soil types and series within counties or comparable areas and to the subsequent grouping of the series into great soil groups and orders.

The lower categories of classification, the soil series, type, and phase, are defined in the section "How Soils are Mapped and Classified." The soil series are classified into great soil groups, and the groups into soil orders.[10]

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[9] UNITED STATES DEPARTMENT OF AGRICULTURE. SOILS AND MEN. U.S. Dept. Agr. Ybk., pp. 979–1001. 1938.

[10] THORP, JAMES and SMITH, GUY D. HIGHER CATEGORIES OF SOIL CLASSIFICATION: ORDER, SUBORDER, AND GREAT SOIL GROUPS. Soil Sci. 67: 117–126. 1949.

A great soil group consists of soils that have fundamental characteristics in common.

There are three soil orders—the zonal, the intrazonal, and the azonal. All three are represented in this county.

The zonal order is made up of soils that have a well-developed profile. These soils reflect the predominant influence of climate and plant and animal life in their formation. The zonal order is represented in Greer County by the Reddish Chestnut, Reddish-Brown, Brunizem, and Red-Yellow Podzolic great soil groups.

Soils in the intrazonal order have more or less well-developed, genetically related horizons that reflect the dominant influence of some local factor, such as relief or parent material, over the effects of climate and plant and animal life. In this county the intrazonal order is represented by Calcisols and by Chestnut soils that intergrade toward Regosols.

The azonal order is made up of soils that lack a well-developed profile because of youth, resistant parent material, or steepness. In this county the azonal order is represented by Alluvial soils, Regosols, and Lithosols.

In table 7 the soil series of this county are classified by order and great soil group and some important characteristics of each series are given. The great soil groups are described and the soils within each group are listed in the pages that follow.

Reddish Chestnut soils

Reddish Chestnut soils form under a cover of mixed grasses in a warm-temperate, semiarid or subhumid climate. These soils have a brown or darker surface layer that has granular structure and is slightly acid to moderately alkaline in reaction. The subsoil generally is reddish brown in color, blocky or prismatic in structure, and neutral to moderately alkaline in reaction. In some soils a weak zone of calcium carbonate has accumulated in the lower part of the subsoil or in the upper part of the parent material. The subsoil grades to parent material that is reddish in color and neutral to moderately alkaline in reaction. The parent material in this county is weak to compact, moderately to highly calcareous marine clay, shale, and sandstone of the red beds. Additional parent materials are moderately gravelly old alluvium washed from nearby granitic mountains or old alluvium that has been reworked by wind.

The Reddish Chestnut group is represented in Greer County by the Abilene, Altus, Carey, Hollister, La Casa, Lawton, Miles, Springer, St. Paul, Tillman, and Tipton series.

Reddish-Brown soils

Reddish-Brown soils form under a cover of grasses and shrubs in a warm-temperate, semiarid or subhumid climate. Normally, the profile includes a whitish horizon of lime accumulation. In the Reddish-Brown soils of Greer County, the depth to this horizon is greater than in typical Reddish-Brown soils.

The Reddish-Brown group is represented in this county by the Brownfield series.

Brunizems

These soils form in a fairly humid, temperate climate, generally under tall grasses. They have a thick, dark-colored surface layer that is neutral or slightly acid in reaction and high in content of organic matter. The upper part of the subsoil is dark brown to reddish brown in color and neutral or slightly acid in reaction. The lower part is mottled and is neutral or alkaline in reaction. The parent material is mottled, alkaline old alluvium.

The Brunizem group is represented in this county by the Meno series.

Red-Yellow Podzolic soils

Members of this great soil group form under forest in a humid, warm-temperate climate. These soils have a thin surface layer that is dark grayish brown in color and medium acid to neutral in reaction. Below this layer is a thick, light-colored, leached layer that is slightly acid or neutral in reaction. The subsoil is a thick, yellowish-red or reddish-yellow layer that has an accumulation of clay. It is medium acid to neutral in reaction. The parent material is old alluvium that is reddish in color, neutral in reaction, and siliceous.

The Red-Yellow Podzolic group is represented in this county by the Nobscot series.

Calcisols

Calcisols form from parent material that is high in calcium carbonate. Leaching has moved only a small percentage of the calcium carbonate from the surface layer into the lower part of the profile. As a result, the parent material has been only weakly modified by the soil-forming processes. These soils lack a B2t horizon.

The Calcisol group is represented in this county by the Acme and Weymouth series.

Chestnut soils intergrading toward Regosols

These soils form in a warm-temperate, semiarid climate under a cover of tall and mid grasses. They have a brown or darker surface layer that has granular structure and, commonly, a moderately alkaline reaction. Below the surface layer is a thick transitional layer, which grades into reddish parent material. These soils lack a B2t horizon, which the zonal soils have. The parent material is calcareous old alluvium or weakly consolidated, calcareous sandstone of the red beds.

The Mansic and Woodward soils are classified as Chestnut soils that intergrade toward Regosols.

Alluvial soils

Alluvial soils form in material transported and recently deposited on flood plains, alluvial fans, and aprons. These are youthful soils, characterized by a weak modification of the parent material by soil-forming processes. They have a slightly darkened surface layer, which grades into variable parent material.

The Alluvial group is represented in Greer County by the Mangum, Spur, Treadway, and Yahola series.

Regosols

Regosols consist of deep, soft mineral deposits or weakly consolidated rock in which few or no clearly

TABLE 7.—*Soil series classified by higher categories, and some factors that have contributed to the morphology of the soils*

Great soil group	Soil series	Parent material	Relief	Moisture regime	Native vegetation
ZONAL ORDER					
Reddish Chestnut.	Abilene	Calcareous old alluvium	Nearly level	Normal	Short and mid grasses.
	Altus	Calcareous old alluvium	Nearly level or gently sloping.	Normal	Tall and mid grasses.
	Carey	Calcareous sandstone of the Permian red beds.	Gently sloping	Normal	Tall and mid grasses.
	Hollister	Old alluvium or calcareous, clayey Permian red beds.	Nearly level	Normal	Short and mid grasses.
	La Casa	Calcareous, clayey Permian red beds.	Gently sloping	Normal	Short and mid grasses.
	Lawton	Granitic outwash	Nearly level to strongly sloping.	Normal	Tall and mid grasses.
	Miles	Old sandy alluvium	Nearly level or gently sloping.	Normal	Tall and mid grasses.
	Springer	Old alluvium reworked by wind.	Nearly level to strongly sloping.	Normal	Tall grasses.
	St. Paul	Calcareous, Permian silty shale and sandstone or old alluvium.	Nearly level or gently sloping.	Normal	Short and mid grasses.
	Tillman	Calcareous, marine clay and clayey shale of Permian age.	Nearly level or gently sloping.	Droughty	Short and mid grasses.
	Tipton	Calcareous old alluvium	Nearly level or gently sloping.	Normal	Tall and mid grasses.
Reddish-Brown.	Brownfield	Old alluvium reworked by wind.	Nearly level or gently sloping.	Normal	Shinnery oak and tall grasses.
Brunizem.	Meno	Old sandy alluvium	Nearly level	Subirrigated	Tall grasses.
Red-Yellow Podzolic.	Nobscot	Old alluvium reworked by wind.	Nearly level to moderately steep.	Normal	Shinnery oak and tall grasses.
INTRAZONAL ORDER					
Calcisol.	Acme	Residuum from weathered beds of gypsum; high in calcium carbonate.	Gently sloping	Normal	Tall and mid grasses.
	Weymouth	Residuum from Permian red beds; high in calcium carbonate.	Gently sloping to moderately steep.	Normal	Mid grasses.
Chestnut (intergrading toward Regosol).	Mansic	Calcareous old alluvium	Nearly level	Normal	Tall and mid grasses.
	Woodward	Residuum from weathered, calcareous, weakly consolidated sandstone of the Permian red beds.	Gently sloping to moderately steep.	Normal	Tall and mid grasses.
AZONAL ORDER					
Alluvial.	Mangum	Calcareous clayey alluvium	Nearly level	Droughty	Mid and tall grasses.
	Spur	Calcareous mixed alluvium	Nearly level	Normal	Tall grasses.
	Treadway	Calcareous clayey and loamy alluvium.	Nearly level	Droughty	Short grasses.
	Yahola	Calcareous sandy alluvium	Nearly level	Normal	Tall grasses.
Regosol.	Enterprise	Calcareous eolian or alluvial material.	Nearly level to strongly sloping.	Normal	Tall and mid grasses.
	Tivoli	Wind-laid sandy deposits	Duned or hummocky	Normal	Tall grasses and sand sage.
Lithosol.	Cottonwood	Residuum from weathered beds of gypsum.	Nearly level or gently sloping.	Droughty	Mid and short grasses.
	Quinlan	Calcareous Permian sandstone.	Gently sloping to moderately steep.	Normal	Tall and mid grasses.
	Tarrant	Residuum from weathered dolomitic limestone.	Nearly level or gently sloping.	Normal	Mid and tall grasses.
	Vernon	Clayey shale and marine clay of the Permian red beds.	Strongly sloping to moderately steep.	Droughty	Mid and short grasses.

expressed soil characteristics have formed. These soils commonly occur on dunes or steep slopes. They have a darkened surface layer and are underlain by slightly weathered parent material. This material, which is eolian sand or weakly consolidated sandstone and pack-sand of the red beds, normally is neutral to moderately alkaline in reaction.

The Regosols are represented in this county by the Enterprise and Tivoli series.

Lithosols

Lithosols are youthful, shallow and very shallow soils over consolidated bedrock. These soils occur on gently sloping to moderately steep uplands and have few or no clearly expressed profile characteristics. The Lithosols in Greer County have a thin, alkaline surface layer and are underlain by consolidated gypsum, sandstone, dolomitic limestone, or clay of Permian age.

Lithosols are represented in this county by the Cottonwood, Quinlan, Tarrant, and Vernon series.

Detailed Descriptions of Soil Series

In this section the soil series in Greer County are discussed in alphabetic order and a representative profile of each series is described in detail.

Abilene Series

The soils of the Abilene series are zonal Reddish Chestnut soils of the uplands. They formed under short and mid grasses in calcareous old alluvium. They are well drained.

The Abilene soils in Greer County are nearly level. They are of minor extent and occur mainly in the vicinities of Willow and Hester.

The Abilene soils have more clayey A and B horizons than the Altus soils and are less deeply leached of calcium carbonate. They have less reddish B horizons than the Miles soils, have more clayey A and B horizons, and are less deeply leached of calcium carbonate. The Abilene soils have more distinct horizons and a more clayey B2t horizon than the Tipton soils. They have less reddish B2t and B3 horizons and are more alkaline than the Lawton soils, and they lack the granitic pebbles that occur in those soils. The Abilene soils are less reddish in the B3 and C horizons than the St. Paul soils and are less deeply leached of calcium carbonate. They have a less clayey B2t horizon and are more permeable than the Hollister soils. The Abilene soils are more deeply leached of calcium carbonate than the Tillman soils and have a less reddish, less clayey, and more permeable B2t horizon.

Typical profile of Abilene clay loam, in a cultivated field located in the NW¼NE¼NW¼ sec. 28, T. 4 N., R. 21 W.

Ap—0 to 7 inches, grayish-brown (10YR 5/2) light clay loam; very dark grayish brown (10YR 3/2) when moist; weak, medium, granular structure; friable when moist, hard when dry; pH 6.6; plowed boundary. 4 to 8 inches thick.

A12—7 to 14 inches, dark grayish-brown (10YR 4/2) clay loam; very dark grayish brown (10YR 3/2) when moist; moderate, medium, granular structure; friable when moist, hard when dry; pH 6.6; gradual boundary. 5 to 10 inches thick.

B1—14 to 20 inches, dark grayish-brown (10YR 4/2) clay loam; very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure; friable when moist, hard when dry; prominent clay films on faces of peds; pH 7.0; gradual boundary. 4 to 8 inches thick.

B2t—20 to 32 inches, dark grayish-brown (10YR 4/2) heavy clay loam; very dark grayish brown (10YR 3/2) when moist; moderate, medium and fine, blocky structure; firm when moist, very hard when dry; prominent clay films on faces of peds; pH 7.0; gradual boundary. 10 to 15 inches thick.

B3—32 to 42 inches, grayish-brown (10YR 5/2) clay loam; dark grayish brown (10YR 4/2) when moist; moderate, medium, blocky structure; firm when moist, very hard when dry; prominent clay films on faces of peds; calcareous; some soft lime concretions; gradual boundary. 6 to 12 inches thick.

C—42 to 60 inches +, grayish-brown (10YR 5/2) clay loam; dark grayish brown (10YR 4/2) when moist; mottled with streaks of dark gray (10YR 4/1), and these streaks are very dark gray when moist; structureless; firm when moist, very hard when dry; contains some coarse sand; small, hard concretions of calcium carbonate and a few pockets of salt crystals; strongly calcareous.

The texture of the A horizon ranges from clay loam to heavy loam, and the thickness ranges from 10 to 15 inches. The color has a hue of 7.5YR or 10YR, a value of 4 to 5 for dry soil and of 2 to 3 for moist soil, and a chroma of 2 to 3. The structure is granular. The reaction, or pH value, is 6.6 to 7.3.

The texture of the B1 and B2t horizons ranges from light clay loam to heavy clay loam. The color ranges from brown to dark grayish brown. The structure of the B1 horizon is granular or subangular blocky; that of the B2t and B3 horizons is subangular blocky or blocky. The reaction ranges from 6.6 to 8.4. A few calcium carbonate concretions occur in the B3 horizon, as well as in the C horizon.

The texture of the C horizon is clay loam, and the color is brown, gray, or grayish brown. The depth to calcareous material ranges from 25 to 35 inches. In a few areas there is a thin Cca horizon.

Acme Series

The soils of the Acme series are intrazonal Calcisols of the uplands. They formed under tall and mid grasses, either in beds of slightly weathered gypsum that contained a large amount of calcium carbonate or in soft, calcareous, impure gypsum that has been redeposited by water. They are well drained.

The Acme soils in Greer County are gently sloping or sloping. They occur in the vicinities of Jester and Reed and are minor in extent.

The Acme soils have a more grayish AC horizon than the Weymouth soils. They are less grayish than the Mansic soils and lack the Cca horizon that is characteristic of the Weymouth and Mansic soils. They have less reddish A and AC horizons and are more clayey than the Woodward soils.

Typical profile of Acme clay loam, in a native pasture located in the NW¼NW¼SW¼ sec. 1, T. 6 N., R. 24 W.

A1—0 to 10 inches, dark grayish-brown (10YR 4/2) light clay loam; very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; friable when moist, hard when dry; calcareous; gradual boundary. 8 to 12 inches thick.

AC—10 to 24 inches, brown (7.5YR 5/3) clay loam; dark brown (7.5YR 4/3) when moist; moderate, fine, subangular blocky structure; friable when moist, hard when dry; calcareous, with a few lime concretions; gradual boundary. 8 to 16 inches thick.

Ccs—24 to 40 inches +, white (N 9/0) chalky material consisting chiefly of gypsum; calcareous.

The texture of the A1 horizon is light clay loam to heavy loam. The color has a hue of 10YR, a value of 4 to 5 for dry soil and of 3 for moist soil, and a chroma of 2 to 3.

The texture of the AC horizon is clay loam. The color has hues of 5YR to 10YR, a value of 4 to 5 for dry soil and of 3 to 4 for moist soil, and a chroma of 2 to 4. The structure is granular or subangular blocky.

The Ccs horizon consists of soft, calcareous, impure gypsum that has been redeposited by water. In some places this horizon is only about 2 to 4 inches thick and rests on an R horizon of hard, calcareous, impure gypsum. The gypsum ranges from 3 to several feet in thickness.

Altus Series

The soils of the Altus series are zonal Reddish Chestnut soils of the uplands. They formed under tall and mid grasses in calcareous old alluvium. These soils are well drained. The depth to the water table normally is 8 to 15 feet, but it may be 3½ feet during cool, wet years.

The Altus soils in Greer County are nearly level. They occur throughout the county but are minor in extent.

The Altus soils occur with and are closely related to the Miles soils, but the Altus soils have a darker A1 horizon and a less reddish B2t horizon. They have a more sandy and more permeable B2t horizon and a more reddish C horizon than the Abilene and Hollister soils. The Altus soils have a darker A horizon and a less reddish and more clayey B2t horizon than the Springer soils. They are more alkaline in reaction than the Lawton soils and have a more sandy B2t horizon than the Lawton and the Tipton soils.

Typical profile of Altus fine sandy loam, in a cultivated field located in the NW¼SW¼SW¼ sec. 6, T. 4 N., R. 21 W.

Ap—0 to 5 inches, grayish-brown (10YR 5/2) fine sandy loam; very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; very friable when moist, slightly hard when dry; pH 7.0; plowed boundary. 4 to 10 inches thick.

A12—5 to 15 inches, grayish-brown (10YR 5/2) fine sandy loam; very dark grayish brown (10YR 3/2) when moist; moderate, fine, granular structure; very friable when moist, slightly hard when dry; pH 7.0; gradual boundary. 6 to 12 inches thick.

B1—15 to 21 inches, dark grayish-brown (10YR 4/2), sticky sandy loam; very dark brown (10YR 2/2) when moist; moderate, medium, granular structure; friable when moist, hard when dry; pH 7.3; gradual boundary. 4 to 8 inches thick.

B2t—21 to 35 inches, dark-brown (7.5YR 4/2) sandy clay loam; dark brown (7.5YR 3/2) when moist; moderate, medium, prismatic structure; friable or firm when moist, very hard when dry; prominent clay films on faces of peds; pH 7.5; gradual boundary. 12 to 16 inches thick.

B3—35 to 45 inches, reddish-brown (5YR 5/3) sandy clay loam; reddish brown (5YR 4/3) when moist; moderate, medium, subangular blocky structure; friable or firm when moist, very hard when dry; pH 7.5; gradual boundary. 8 to 15 inches thick.

C—45 to 60 inches +, yellowish-red (5YR 5/6) sandy clay loam; yellowish red (5YR 4/6) when moist; 40 percent of layer mottled with gray (N 5/0) or dark gray (N 4/0) when moist; weak, subangular blocky structure; friable when moist, very hard when dry; water table at depth of 50 inches; some iron concretions; calcareous.

The thickness of the A horizon ranges from 12 to 18 inches. The color has a hue of 7.5YR or 10YR, a value of 3 to 5 for dry soil and of 2 to 3 for moist soil, and a chroma of 2. The reaction, or pH value, is 6.1 to 7.3.

The texture of the B2t horizon ranges from heavy fine sandy loam to medium sandy clay loam. The color, which ranges from brown to dark brown, has a hue of 7.5YR or 10YR. The structure is prismatic or subangular blocky. The reaction is 6.6 to 7.8. The color in the lower part of the B horizon is reddish brown in a hue of 5YR. Mottles in this part range from none to many.

The texture of the C horizon ranges from fine sandy loam to medium sandy clay loam. Mottles range from few to many and consist of spots and streaks that are grayer, yellower, or redder than the matrix. The reaction of the C horizon is neutral or mildly alkaline.

Brownfield Series

The soils of the Brownfield series are zonal Reddish-Brown soils of the uplands. They formed under shinnery oak and tall grasses from old alluvium that had been reworked by wind. They are well drained.

The Brownfield soils in Greer County are nearly level or gently sloping. They occur throughout the county.

The Brownfield soils have more sandy A and B horizons than the Meno soils and are not mottled. They have a more clayey B2t horizon than the Nobscot soils. They have a lighter colored and more sandy A horizon than the Miles soils. The Brownfield soils have a more sandy A horizon and a more clayey B2t horizon than the Springer soils. They have a more sandy and lighter colored A horizon and a more reddish B2t horizon than the Altus soils.

Typical profile of Brownfield fine sand, in a cultivated field located in the NE¼NE¼SE¼ sec. 27, T. 4 N., R. 24 W.

Ap—0 to 18 inches, pale-brown (10YR 6/3) fine sand; brown (10YR 5/3) when moist; structureless; loose when moist, loose when dry; pH 6.1; plowed boundary. 4 to 22 inches thick.

B21t—18 to 32 inches, reddish-brown (5YR 4/3) sandy clay loam; dark reddish brown (5YR 3/3) when moist; moderate, medium, prismatic structure; friable when moist, hard when dry; clay films on faces of peds; pH 6.1; gradual boundary. 6 to 18 inches thick.

B22t—32 to 44 inches, yellowish-red (5YR 5/6) light sandy clay loam; yellowish red (5YR 4/6) when moist; weak, coarse, prismatic structure; friable when moist, hard when dry; clay films on faces of peds; pH 6.5; gradual boundary. 6 to 12 inches thick.

C—44 to 60 inches +, yellowish-red (5YR 5/8) sandy loam; yellowish red (5YR 4/8) when moist; massive (structureless); friable when moist, hard when dry; pH 7.0.

The Ap horizon ranges from 14 to 24 inches in thickness. The reaction, or pH value, is 6.1 to 7.3. In a few areas that have not been cultivated, there is a grayish-brown or dark grayish-brown A1 horizon, 4 to 8 inches thick, that has a clear boundary. Beneath this horizon is a pale brown or very pale brown A2 horizon. The

thickness of the A2 horizon, where present, ranges from 10 to 16 inches. The boundary is irregular and wavy.

The texture of the B2t horizon is sandy clay loam. The color is reddish brown or yellowish red. The structure is prismatic or subangular blocky. The reaction of the B2t horizon is slightly acid or neutral.

The texture of the C horizon is sandy loam or sticky sandy loam. The color is yellowish red or reddish yellow. The reaction is pH 6.6 to 7.3.

Carey Series

The soils of the Carey series are zonal Reddish Chestnut soils of the uplands. They formed under tall and mid grasses in weakly consolidated, calcareous, fine-grained sandstone.

Carey soils occur in the vicinity of Plainview. They are of minor extent in this county.

The Carey soils are less clayey than the St. Paul soils, are less dark colored in the B2t horizon, have calcium carbonate closer to the surface, and have less distinct layers. The Carey soils are more alkaline than the Lawton soils, have a less clayey B2t horizon, and formed from a different kind of parent material. They are less clayey and have a more permeable B2t horizon than the La Casa and Tillman soils.

Typical profile of Carey loam, in a cultivated field located in the SW¼SW¼SE¼ sec. 15, T. 7 N., R. 24 W.

Ap—0 to 6 inches, brown (7.5YR 5/4) loam; dark brown (7.5YR 3/4) when moist; weak, granular structure; friable when moist, slightly hard when dry; pH 7.3; plowed boundary. 4 to 6 inches thick.

A12 -6 to 12 inches, brown (7.5YR 5/4) loam; dark brown (7.5YR 3/4) when moist; weak, fine, granular structure; friable when moist, hard when dry; many worm casts; pH 7.3; gradual boundary. 6 to 10 inches thick.

B21t—12 to 24 inches, reddish-brown (5YR 4/3) clay loam; dark reddish brown (5YR 3/3) when moist; weak, medium, prismatic structure breaking to moderate, medium, granular structure with clay films on peds; friable when moist, hard when dry; pH 7.5; clear boundary. 10 to 15 inches thick.

B22t—24 to 34 inches, yellowish-red (5YR 4/6) clay loam; yellowish red (5YR 3/6) when moist; moderate or weak, medium, prismatic structure with clay films on peds; friable when moist, hard when dry; calcareous; gradual boundary. 5 to 15 inches thick.

C—34 to 46 inches +, red (2.5YR 4/6) heavy loam; dark red (2.5YR 3/6) when moist; massive (structureless); friable when moist, hard when dry; calcareous.

The texture of the A horizon is loam. The color is brown or reddish brown in hues of 7.5YR and 5YR.

The texture of the B2t horizon ranges from loam to light clay loam. The color ranges from reddish brown to yellowish red in a hue of 5YR. The structure ranges from granular to prismatic. The upper part of the B horizon ranges from neutral to mildly alkaline in reaction; the lower part is calcareous.

The texture of the C horizon ranges from loam to light clay loam. The color is red or yellowish red in hues of 2.5YR and 5YR. The depth to calcareous material generally is 25 inches, but it ranges from 18 to 35 inches.

Cottonwood Series

The soils of the Cottonwood series are azonal Lithosols of the uplands. They formed under short and mid grasses in calcareous material weathered from beds of white crystalline gypsum.

Cottonwood soils occur in the vicinities of Reed and Jester.

The Cottonwood soils are less clayey and less reddish than the Vernon soils. They are less reddish than the Quinlan soils, which formed from sandstone instead of gypsum. The Cottonwood soils differ from the Tarrant soils, which formed in material derived from dolomitic limestone. They are not so deep as the Acme soils and have less distinct horizons.

Typical profile of Cottonwood loam, in a native pasture located in the SE¼SW¼SE¼SE¼ sec. 26, T. 5 N., R. 24 W.

A1—0 to 6 inches, brown (7.5YR 5/4) loam; dark brown (7.5YR 3/4) when moist; weak, fine, granular structure; friable when moist, slightly hard when dry; calcareous; abrupt boundary. 4 to 12 inches thick.

Ccs—6 to 10 inches, white (N 9/0) chalky material consisting chiefly of gypsum; calcareous; abrupt boundary. 2 to 6 inches thick.

R—10 inches to several feet, white (N 9/0) hard, impure gypsum; calcareous.

The texture of the A horizon is loam. The color ranges from brown to light grayish brown in hues of 7.5YR and 10YR. The Ccs horizon consists of slightly altered, impure gypsum that is white in color and strongly alkaline in reaction. In places the soil is no more than 4 inches thick over gypsum.

Enterprise Series

The soils of the Enterprise series are azonal Regosols on nearly level to strongly sloping terraces, 20 to 100 feet above the river channels. These soils formed under tall and mid grasses in calcareous, eolian or alluvial material.

The Enterprise soils are more sandy than the Woodward soils, which formed in weathered sandstone instead of in alluvium or eolian deposits. The Enterprise soils are less clayey than the Tipton soils, are more reddish in the subsoil, and lack a B2t horizon. They are more clayey and less siliceous than the Tivoli soils. The Enterprise soils are more sandy than the Weymouth soils and formed from less clayey parent material.

Typical profile of Enterprise very fine sandy loam, in a cultivated field located in the SW¼SE¼NW¼ sec. 18, T. 4 N., R. 21 W.

Ap—0 to 9 inches, dark-brown (7.5YR 4/4) very fine sandy loam; dark brown (7.5YR 3/4) when moist; weak, granular structure; very friable when moist, slightly hard when dry; noncalcareous; pH 8.0; plowed boundary. 4 to 10 inches thick.

A12—9 to 18 inches, dark-brown (7.5YR 4/4) very fine sandy loam; dark brown (7.5YR 3/4) when moist; moderate, fine, granular structure; very friable when moist, slightly hard when dry; calcareous; films of calcium carbonate on faces of peds; gradual boundary. 6 to 10 inches thick.

AC—18 to 30 inches, brown (7.5YR 5/4) very fine sandy loam; dark brown (7.5YR 4/4) when moist; weak or moderate, medium or coarse, prismatic structure; very friable when moist, slightly hard when dry; calcareous; films of calcium carbonate on faces of prisms; gradual boundary. 5 to 15 inches thick.

C—30 to 60 inches +, yellowish-red (5YR 5/6) very fine sandy loam; yellowish red (5YR 4/6) when moist; structureless; very friable when moist, slightly hard when dry; calcareous.

The texture of the A horizon is very fine sandy loam, and the thickness ranges from 10 to 20 inches. The color

is brown or dark brown. The reaction is mildly alkaline or moderately alkaline.

The texture of the AC horizon is very fine sandy loam. The color is dark brown, reddish brown, or yellowish red. The structure ranges from prismatic to granular. The depth to calcium carbonate ranges from near the surface to about 30 inches.

The texture of the C horizon is very fine sandy loam. The color is reddish brown or yellowish red.

Hollister Series

The soils of the Hollister series are zonal Reddish Chestnut soils of the uplands. These soils formed under short and mid grasses in old alluvium or in clayey material of the Permian red beds.

The Hollister soils in Greer County are nearly level. They occur south of Mangum and in the vicinity of Jester.

The Hollister soils resemble the Tillman soils, but they have darker A horizons and less reddish B horizons. They have a more clayey and less permeable B2t horizon than the Abilene soils. The Hollister soils have a more clayey, less permeable, and less reddish B2t horizon than the St. Paul and La Casa soils. They have a more clayey, less permeable, and less reddish B2t horizon than the Lawton soils and are more alkaline in reaction.

Typical profile of Hollister clay loam, in a cultivated field located in the SE¼SE¼NE¼ sec. 14, T. 3 N., R. 22 W.

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) clay loam; very dark grayish brown (10YR 3/2) when moist; weak, granular structure; firm when moist, hard when dry; noncalcareous; pH 8.0; plowed boundary. 4 to 6 inches thick.

A12—5 to 8 inches, very dark grayish-brown (10YR 3/2) clay loam; very dark brown (10YR 2/2) when moist; moderate, medium, granular structure; firm when moist, hard when dry; noncalcareous; pH 8.0; gradual boundary. 1 to 4 inches thick.

B1—8 to 15 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam; very dark grayish brown (10YR 3/2) when moist; moderate, fine, subangular blocky structure; firm when moist, hard when dry; noncalcareous; pH 8.0; gradual boundary. 5 to 8 inches thick.

B21t—15 to 22 inches, dark-brown (7.5YR 4/2) silty clay; dark brown (7.5YR 3/2) when moist; moderate, fine blocky structure; very firm when moist, very hard when dry; clay films on faces of peds; noncalcareous; pH 8.0; gradual boundary. 7 to 15 inches thick.

B22t—22 to 42 inches, brown (7.5YR 5/2) silty clay loam; dark brown (7.5YR 4/2) when moist; moderate coarse, blocky structure; very firm when moist, very hard when dry; clay films on faces of peds; calcareous; some lime concretions; gradual boundary. 10 to 25 inches thick.

C—42 to 60 inches +, dark-gray (10YR 4/1) clay loam; very dark gray (10YR 3/1) when moist; weak, coarse, blocky structure; firm when moist, hard when dry; contains some gyp crystals and some small hard concretions of calcium carbonate; calcareous.

The thickness of the A horizon ranges from 5 to 10 inches. The texture is clay loam in most places but is silty clay loam in some. The color has hues of 7.5YR and 10YR, a value of 3 to 5 for dry soil and of 2 to 4 for moist soil, and a chroma of 2 to 3.

The texture of the B2t horizon is clay, silty clay, silty clay loam, or heavy clay loam. The upper part of the B horizon has subangular blocky structure, and the lower part has blocky structure. The color has hues of 7.5YR and 10YR, a value of 3 to 5 for dry soil and of 3 to 4 for moist soil, and a chroma of 2 to 3.

The texture of the C horizon is clay or clay loam. The color ranges from gray to reddish brown. The depth to calcareous material ranges from 20 to 25 inches. In a few places a calcium carbonate horizon is present.

La Casa Series

The soils of the La Casa series are zonal Reddish Chestnut soils of the uplands. These soils formed under short and mid grasses in material derived from clayey Permian red beds that contained layers of dolomitic limestone and were high in content of calcium carbonate. La Casa soils occur in the western half of Greer County.

The La Casa soils have a more clayey A12 horizon than the St. Paul soils and have calcium carbonate nearer the surface. They have a more reddish B horizon than the Abilene soils, which formed in old alluvium. The La Casa soils have a less clayey and more friable B2t horizon than the Tillman soils. They have a more reddish, more permeable, and less clayey B2t horizon than the Hollister soils. The La Casa soils have a more clayey A horizon than the Lawton soils and are more alkaline. They lack the granitic pebbles present in the Lawton soils.

Typical profile of La Casa clay loam, in a cultivated field located 0.3 mile north and 0.1 mile east of the southwest corner of sec. 24, T. 5 N., R. 23 W.

Ap—0 to 6 inches, brown (7.5YR 5/4) light clay loam; dark brown (7.5YR 3/4) when moist; weak, medium, granular structure; friable when moist, hard when dry; mass is noncalcareous, but spots of calcium carbonate occur; pH 8.0; plowed boundary. 4 to 6 inches thick.

A12—6 to 11 inches, dark-brown (7.5YR 4/2) light clay loam; dark brown (7.5YR 3/2) when moist; moderate, medium, granular structure; friable when moist, hard when dry; many worm casts; noncalcareous; pH 8.0; gradual boundary. 4 to 10 inches thick.

B21t—11 to 16 inches, reddish-brown (5YR 4/3) clay loam; dark reddish brown (5YR 3/3) when moist; moderate, fine or medium, subangular blocky structure; friable when moist, hard when dry; clay films on faces of peds; worm casts; mass is noncalcareous, but some spots of calcium carbonate occur; pH 8.0; clear boundary. 4 to 10 inches thick.

B22t—16 to 24 inches, reddish-brown (5YR 5/3) clay loam; reddish brown (5YR 4/3) when moist; moderate, fine or medium, subangular blocky structure; firm when moist, very hard when dry; clay films on faces of peds; calcareous; clear boundary. 6 to 10 inches thick.

B3ca—24 to 31 inches, reddish-brown (5YR 5/3) clay loam; reddish brown (5YR 4/3) when moist; moderate, medium, blocky structure; firm when moist, very hard when dry; calcareous; many small concretions of calcium carbonate; gradual boundary. 6 to 12 inches thick.

Cca—31 to 45 inches +, reddish-brown (2.5YR 5/4) clay loam; reddish brown (2.5YR 4/4) when moist; weak, fine, blocky structure; firm when moist, very hard when dry; calcareous; numerous lime concretions and blotches.

The texture of the A horizon ranges from heavy loam to light clay loam. The color is brown, dark brown, or dark grayish brown in hues of 7.5YR and 10YR. The reaction is neutral or mildly alkaline.

The texture of the B2t horizon ranges from clay loam to light clay. The color of the B horizon is brown, dark brown, or reddish brown in hues of 5YR and 7.5YR. The structure ranges from subangular blocky to blocky.

The texture of the C horizon is clay loam or light clay. The color is reddish brown or yellowish red in hues of 2.5YR and 5YR. The depth to calcareous material ranges from 15 to 30 inches. Generally, a calcium carbonate horizon is present, though sometimes it is very weakly expressed. In a few places beds of dolomitic limestone occur at a depth of 3 feet.

Lawton Series

The soils of the Lawton series are zonal Reddish Chestnut soils of the uplands. These soils formed under tall and mid grasses in old granitic outwash materials that are mildly alkaline in reaction.

Most areas of the Lawton soils in Greer County occupy nearly level to strongly sloping foot slopes of the Wichita Mountains in the eastern part of the county. Other areas occur in the vicinities of Mangum and Reed.

The Lawton soils have a less clayey, less reddish, and more permeable B2t horizon than the Hollister soils and are less alkaline. They have a more reddish B horizon and are less alkaline than the Abilene soils, which lack granitic pebbles. The Lawton soils have less clayey A horizons and are less alkaline than the La Casa soils, which also lack granitic pebbles. They have more distinct horizons throughout and a more clayey and reddish B2t horizon than the Tipton soils. They are less alkaline and less silty than the St. Paul soils. The Lawton soils have more distinct layers and a more clayey B2t horizon than the Miles soils. They have a less clayey B2t horizon and are less alkaline than the Tillman soils.

Typical profile of Lawton loam, in a cultivated field located in the SW¼NW¼SW¼ sec. 30, T. 6 N., R. 20 W.

Ap—0 to 6 inches, dark-brown (7.5YR 4/3) loam; dark brown (7.5YR 3/3) when moist; weak, fine, granular structure; friable when moist, slightly hard when dry; scattered granitic pebbles make up less than 1 percent of the mass; pH 6.5; plowed boundary. 4 to 6 inches thick.

A12—6 to 9 inches, dark-brown (7.5YR 4/3) loam; dark brown (7.5YR 3/3) when moist; moderate, fine, granular structure; friable when moist, slightly hard when dry; scattered granitic pebbles make up less than 1 percent of the mass; pH 6.5; gradual boundary. 2 to 6 inches thick.

B1—9 to 14 inches, dark-brown (7.5YR 4/2) light clay loam; dark brown (7.5YR 3/2) when moist; moderate, fine, subangular blocky structure; friable when moist, hard when dry; scattered granitic pebbles make up less than 1 percent of the mass; pH 7.0; gradual boundary. 4 to 7 inches thick.

B2t—14 to 35 inches, reddish-brown (5YR 4/3) clay loam; dark reddish brown (5YR 3/3) when moist; moderate, fine or medium, blocky structure; firm when moist, very hard when dry; thin clay films on ped faces; scattered granitic pebbles make up less than 1 percent of the mass; pH 7.0; gradual boundary. 10 to 22 inches thick.

B3—35 to 45 inches, reddish-brown (5YR 4/4) clay loam; dark reddish brown (5YR 3/4) when moist; moderate, medium, blocky structure; firm when moist, very hard when dry; thin clay films on ped faces; scattered pebbles make up less than 1 percent of the mass; pH 7.0; gradual boundary. 10 to 20 inches thick.

C—45 to 60 inches +, yellowish-red (5YR 4/6) gravelly clay loam; yellowish red (5YR 3/6) when moist; massive (structureless); firm when moist, very hard when dry; a few concretions of calcium carbonate.

The texture of the A horizon is loam in most places but is gravelly loam in some. The thickness ranges from 6 to 12 inches, and the color is brown or dark brown. This horizon is neutral or slightly acid in reaction.

The texture of the B2t horizon is light clay loam, heavy clay loam, or gravelly clay loam. The structure of the B horizon is subangular blocky in the upper part and blocky in the lower part. The color is dark brown, reddish brown, yellowish red, or red in a hue of 5YR. The average depth to calcareous material is 60 inches, but the depth ranges from 40 to 70 inches. Granitic pebbles scattered throughout the profile make up 1 to 30 percent of the mass. The amount generally increases with depth. In a few areas some coarse granitic pebbles, 2 to 3 inches in diameter, occur on the surface. Layers of granitic gravel may occur at a depth of 40 to 80 inches.

Mangum Series

The soils of the Mangum series are azonal Alluvial soils of the bottom lands. These soils formed under mid and tall grasses from clayey alluvium.

The Mangum soils in Greer County occur mainly on the flood plains of Haystack Creek, but small areas border tributaries of the Salt Fork of the Red River. These soils are subject to occasional flooding.

The Mangum soils are associated with the Treadway soils and resemble them in color, texture, and reaction, but the Mangum soils have thicker, better developed horizons. They are more clayey and less permeable than the Yahola and Spur soils.

Typical profile of Mangum clay, in a native pasture located in the NW¼NW¼NE¼ sec. 25, T. 7 N., R. 23 W.

A1—0 to 8 inches, brown (7.5YR 5/2) clay; dark brown (7.5YR 3/2) when moist; moderate, medium, subangular blocky structure; very firm when moist, very hard when dry; calcareous; clear boundary. 6 to 10 inches thick.

AC—8 to 33 inches, reddish-brown (5YR 5/3) clay; reddish brown (5YR 4/3) when moist; massive (structureless); very firm when moist, very hard when dry; calcareous; gradual boundary. 20 to 30 inches thick.

C—33 to 52 inches +, reddish-brown (5YR 5/4) clay loam; reddish brown (5YR 4/4) when moist; structureless; very firm when moist, hard when dry; calcareous.

The texture of the A horizon is clay. The color is brown or reddish brown in hues of 5YR and 7.5YR. This horizon is mildly alkaline or moderately alkaline in reaction. The texture of the AC horizon is clay. The color is reddish brown in a hue of 5YR. The substratum is stratified with clay, silt loam, and loam that average clay loam in texture. The color generally is reddish brown. The reaction is moderately alkaline.

Mansic Series

The soils of the Mansic series are intrazonal Chestnut soils that intergrade toward Regosols. They formed on uplands under tall and mid grasses from calcareous old alluvium. They are well drained.

The Mansic soils in Greer County are nearly level. They are minor in extent and occur in the vicinity of Lake Creek.

The Mansic soils have grayer and less reddish A and AC horizons than the Weymouth soils. They are darker, are more clayey, and contain more calcium carbonate in the C horizon than the Enterprise soils. The Mansic soils have less distinct layers than the Abilene soils and lack the B2t horizon that occurs in those soils. They

have more clayey A horizons and a darker subsoil than the Miles soils, which also have a B2t horizon. The Mansic soils have a less reddish subsoil and contain more calcium carbonate in the C horizon than the Woodward soils. They are more grayish than the Acme soils and, unlike them, lack a Ccs horizon.

Typical profile of Mansic clay loam, in a cultivated field located in the SE¼SE¼SE¼ sec. 32, T. 7 N., R. 21 W.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) light clay loam; very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; friable when moist, slightly hard when dry; weakly calcareous; plowed boundary. 4 to 6 inches thick.

A12—9 to 13 inches, dark-gray (10YR 4/1) light clay loam; black (10YR 2/1) when moist; moderate, fine, granular structure; friable when moist, slightly hard when dry; calcareous; gradual boundary. 4 to 10 inches thick.

AC—13 to 23 inches, gray (10YR 5/1) light clay loam; very dark gray (10YR 3/1) when moist; moderate, medium, granular structure; friable when moist, hard when dry; calcareous; a few concretions of calcium carbonate; gradual boundary. 5 to 10 inches thick.

Cca—23 to 37 inches, light-gray (10YR 7/2) clay loam; light brownish gray (10YR 6/2) when moist; granular structure; friable when moist, hard when dry; calcareous; calcium carbonate concretions make up 10 percent of the mass; gradual boundary. 12 to 20 inches thick.

C—37 to 60 inches +, yellowish-red (5YR 5/6) clay loam; yellowish red (5YR 4/6) when moist; structureless; firm when moist, hard when dry; calcareous.

The texture of the A horizon is dominantly clay loam, but it ranges from heavy loam to clay loam. The thickness ranges from 8 to 16 inches. The color is brown, dark grayish brown, or dark gray. The texture of the AC horizon is light clay loam or clay loam. The color is grayish brown or gray.

The texture of the C horizon is clay loam. The color is light gray, grayish brown, yellowish red, or reddish yellow. In most profiles a calcium carbonate horizon is present; from 10 to 30 percent of the C horizon is calcium carbonate. There are some small, nonmarine snails.

Meno Series

The soils of the Meno series are zonal Brunizems of the upland. These soils formed under tall grasses in old alluvium that contained a large amount of sand. They are moderately well drained.

The Meno soils in Greer County are nearly level. They are of minor extent and occur mainly southeast of Mangum.

The Meno soils have a lighter colored A horizon than the Altus soils and are free of mottling to a depth of 30 inches. Unlike the Miles soils, the Meno soils have a mottled B horizon. They have a more clayey B2t horizon than the Springer soils. They have a darker and less sandy A horizon and a more clayey B2t horizon than the Nobscot soils. The Meno soils have a darker and less sandy A horizon than the Brownfield soils, which lack a mottled B horizon.

Typical profile of Meno loamy fine sand, in a cultivated field located in the NW¼NW¼NW¼ sec. 8, T. 4 N., R. 21 W.

Ap—0 to 18 inches, brown (7.5YR 5/2) loamy fine sand; dark brown (7.5YR 4/2) when moist; weak, fine, granular structure; very friable when moist, soft when dry; pH 6.5; plowed boundary. 14 to 24 inches thick.

B21t—18 to 30 inches, reddish-brown (5YR 5/4) sandy clay loam; dark reddish brown (5YR 3/4) when moist; moderate, medium, prismatic structure; friable when moist, hard when dry; clay films on faces of peds; pH 6.5; gradual boundary. 8 to 16 inches thick.

B22t—30 to 39 inches, reddish-brown (5YR 5/4) light sandy clay loam; reddish brown (5YR 4/4) when moist; common, fine and medium, distinct mottles of yellowish red and gray; moderate, coarse, prismatic structure; friable when moist, hard when dry; a few patchy clay films on faces of peds; pH 6.5; clear boundary. 7 to 14 inches thick.

IIB23t—39 to 45 inches, dark-brown (10YR 4/3) clay loam; dark brown (10YR 3/3) when moist; common, fine or medium, distinct mottles of reddish brown, yellowish red, and gray; weak, subangular blocky structure; firm when moist, very hard when dry; clay films on faces of peds; pH 6.5; gradual boundary. 4 to 10 inches thick.

IIC—45 to 60 inches +, gray (10YR 5/1) heavy clay loam; very dark gray (10YR 3/1) when moist; common, fine, distinct mottles of reddish brown; massive (structureless); pH 7.0.

The texture of the A horizon is loamy fine sand. The color is brown or dark brown in a hue of 7.5YR. It has a value of 4 to 5 for dry soil and of 3 to 4 for moist soil and a chroma of 2 to 4. Reaction, or pH value, ranges from 6.1 to 7.3.

The texture of the B2t horizons is heavy sandy clay loam or sandy clay loam with a clay content of about 17 to 27 percent. The color is reddish brown or yellowish red in a hue of 5YR. In some places the IIB23t horizon is absent and the B22t horizon is underlain by the IIC horizon. In the B22t horizon the yellowish-red mottles make up 10 to 20 percent of the matrix, and the gray mottles make up 5 to 10 percent. The reaction of the B horizon ranges from 6.1 to 7.3.

The texture of the IIC horizon ranges from clay loam to light clay. The color is gray, dark brown, or grayish brown. The reddish-brown mottles make up 5 to 10 percent of the matrix. The reaction ranges from 6.6 to 7.8.

Miles Series

The soils of the Miles series are zonal Reddish Chestnut soils of the uplands. They formed under tall and mid grasses from old alluvium that contained a large amount of sand. They are well drained.

The Miles soils in Greer County are nearly level or gently sloping. They are extensive east of Willow, east of Mangum, and in the vicinity of Russell.

The Miles soils are associated with and closely related to the Altus soils, but the Miles soils have a lighter colored A1 horizon, a more reddish B2t horizon, and no mottling in the C horizon. The Miles soils have less distinct layers and a less clayey B2t horizon than the Lawton soils, which formed in granitic outwash and contain granitic pebbles. The Miles soils have a more sandy A1 horizon and a more reddish and less silty B2t horizon than the Tipton soils. They have a darker and less sandy A horizon and a more clayey B2t horizon than the Nobscot soils. The Miles soils have a more clayey B2t horizon than the Springer soils.

Typical profile of Miles fine sandy loam, in a cultivated field located in the NE¼NE¼SW¼ sec. 19, T. 5 N., R. 21 W.

Ap—0 to 6 inches, brown (7.5YR 5/2) light fine sandy loam; dark brown (7.5YR 3/2) when moist; weak, fine, granular structure; very friable when moist, slightly hard when dry; pH 7.0; plowed boundary. 4 to 8 inches thick.

A1—6 to 14 inches, brown (7.5YR 4/2) fine sandy loam; dark brown (7.5YR 3/2) when moist; moderate, fine, granular structure; very friable when moist, slightly hard when dry; pH 7.5; gradual boundary. 4 to 10 inches thick.

B2t—14 to 35 inches, reddish-brown (5YR 5/3) sandy clay loam; dark reddish brown (5YR 3/3) when moist; moderate, medium, prismatic structure; friable when moist, hard when dry; clay films on faces of peds; pH 7.0; gradual boundary. 12 to 25 inches thick.

B3—35 to 55 inches, yellowish-red (5YR 5/6) light sandy clay loam; yellowish red (5YR 4/6) when moist; weak, coarse, prismatic structure; friable when moist, hard when dry; pH 7.0; gradual boundary. 15 to 25 inches thick.

C—55 to 70 inches +, yellowish-red (5YR 5/5) sandy loam; yellowish red (5YR 4/6) when moist; massive (structureless); noncalcareous; pH 8.0.

The texture of the A horizon is fine sandy loam in most places but is loamy fine sand in some. The thickness ranges from 6 to 30 inches. The color is brown, dark brown, or reddish brown in hues of 5YR and 7.5YR. The more sandy the texture, the thicker this layer is and the lighter in color. The reaction, or pH value, ranges from 6.1 to 7.3.

The texture of the B2t horizon is sandy clay loam. The color is reddish brown or yellowish red in a hue of 5YR. The structure is prismatic or blocky. The reaction ranges from 6.6 to 7.8.

The texture of the B3 horizon ranges from sandy loam to sandy clay loam. The color is yellowish red or reddish yellow in a hue of 5YR.

The texture of the C horizon ranges from sandy loam to light sandy clay loam. The color is yellowish red or reddish yellow in a hue of 5YR. The reaction ranges from neutral to moderately alkaline. Scattered water-rounded pebbles occur on the surface and throughout the profile in most places, but they make up less than 1 percent of the soil mass.

Nobscot Series

The soils of the Nobscot series are zonal Red-Yellow Podzolic soils of the uplands. These soils formed under shinnery oak and tall grasses from old alluvium that had been reworked by wind. They are well drained.

The Nobscot soils in Greer County are inextensive. They occur in nearly level to moderately steep areas, mainly northwest of Russell, northeast of Willow, and in the southeastern corner of the county.

The Nobscot soils have more sandy and lighter colored A horizons and a less clayey B2t horizon than the Altus, Meno, and Miles soils. The Nobscot soils have a more sandy and lighter colored A horizon than the Springer soils. They have more distinct layers than the Tivoli soils and have a B2t horizon, which the Tivoli soils lack.

Typical profile of Nobscot fine sand, in a native pasture located in the SE¼SE¼SW¼ sec. 6, T. 7 N., R. 21 W.

A1—0 to 4 inches, grayish-brown (10YR 5/2) fine sand; very dark grayish brown (10YR 3/2) when moist; weak, granular structure to single grain (structureless); loose when moist, loose when dry; pH 6.0; clear boundary. 3 to 6 inches thick.

A2—4 to 19 inches, very pale brown (10YR 7/3) fine sand; brown (10YR 5/3) when moist; structureless; loose when moist, loose when dry; pH 6.0; clear, irregular boundary. 10 to 30 inches thick.

B2t—19 to 41 inches, yellowish-red (5YR 5/6) sandy loam; yellowish red (5YR 4/6) when moist; massive (structureless); very friable when moist, hard when dry; thin, reddish-brown (5YR 4/4) layers of sticky sandy loam; pH 6.5; diffuse boundary. 15 to 25 inches thick.

C—41 to 60 inches +, reddish-yellow (5YR 6/6) loamy fine sand; yellowish red (5YR 5/6) when moist; structureless; loose when moist, slightly hard when dry; yellowish-red (5YR 5/6) layers of sticky sandy loam about one-eighth inch thick; pH 7.0.

The texture of the A1 and A2 horizons is fine sand, and the thickness ranges from 15 to 36 inches. The color in the A1 horizon is grayish brown or dark grayish brown in a hue of 10YR; that of the A2 horizon is pale brown or very pale brown. The reaction, or pH value, ranges from 5.6 to 7.3.

The texture of the B2t horizon ranges from loamy fine sand to fine sandy loam. The color is reddish yellow or yellowish red in a hue of 5YR. The reaction ranges from 5.6 to 7.3. Thin lenses that occur in the B2t horizon and in the upper part of the C horizon range from ⅛ inch to 3 inches in thickness, from sandy loam to sandy clay loam in texture, and from reddish brown to yellowish red in color.

The texture of the C horizon ranges from loamy fine sand to fine sand. The color is yellowish red or reddish yellow. The reaction generally is neutral, but it ranges from 6.1 to 7.8.

Quinlan Series

The soils of the Quinlan series are azonal Lithosols of the uplands. These soils formed under mid and tall grasses in weakly consolidated, calcareous sandstone. The Quinlan soils in Greer County are gently sloping to moderately steep. The main areas are in the northern half of the county.

The Quinlan soils formed from sandier material than the Vernon, Cottonwood, Tarrant, and Weymouth soils. They are more reddish than the Cottonwood or Tarrant soils. They contain less calcium carbonate than the Weymouth soils and are not so deep as the Weymouth or Woodward soils.

Typical profile of Quinlan loam, in a native pasture located in the SE¼SE¼SE¼ sec. 21, T. 7 N., R. 24 W.

A1—0 to 8 inches, reddish-brown (5YR 5/4) loam; dark reddish brown (5YR 3/4) when moist; moderate, fine, granular structure; friable when moist, slightly hard when dry; numerous worm casts; calcareous; gradual boundary. 4 to 18 inches thick.

AC—8 to 13 inches, red (2.5YR 5/6) loam; dark red (2.5YR 3/6) when moist; weak, granular structure; friable when moist, slightly hard when dry; a few sandstone fragments; calcareous; clear boundary. 0 to 8 inches thick.

R—13 to 30 inches +, red (2.5YR 5/6), weakly cemented, calcareous sandstone; a few gray spots; dark red (2.5YR 3/6) when moist.

The texture of the A horizon is loam. The color is reddish brown, brown, or yellowish red in hues of 5YR and 7.5YR. The AC horizon, where it occurs, is not more than 8 inches thick. The color is red or yellowish red in a hue of 2.5YR. The depth to the weakly consolidated sandstone ranges from 10 to 20 inches in most places, but it is less than 10 inches in a few areas.

Springer Series

The soils of the Springer series are zonal Reddish Chestnut soils of the uplands. These soils formed under tall grasses in old alluvium that had been modified by wind. They are well drained.

The Springer soils in Greer County are nearly level to strongly sloping. They are mainly east of Willow, east of Mangum, and in the vicinity of Russell.

The Springer soils have a lighter colored A horizon and a more reddish and less clayey B2t horizon than the Altus soils. They have more distinct layers than the Tivoli soils, which lack a B2t horizon. They have a less clayey B2t horizon than the Miles and Brownfield soils. The Springer soils have a less sandy and darker colored A horizon than the Nobscot soils. They lack the mottling and clayey B2t horizon of the Meno soils.

Typical profile of Springer loamy fine sand, in a cultivated field located in the SE¼SW¼SW¼ sec. 21, T. 5 N., R. 21 W.

Ap—0 to 8 inches, brown (7.5YR 5/4) loamy fine sand; dark brown (7.5YR 3/4) when moist; weak, granular structure; very friable when moist, soft when dry; pH 7.0; plowed boundary. 4 to 16 inches thick.

A12—8 to 19 inches, brown (7.5YR 5/4) loamy fine sand; dark brown (7.5YR 3/4) when moist; moderate, fine, granular structure; very friable when moist, soft when dry; pH 7.0; gradual boundary. 4 to 12 inches thick.

B2t—19 to 33 inches, reddish-brown (5YR 5/4) sandy loam; dark reddish brown (5YR 3/4) when moist; moderate, coarse, prismatic structure; friable when moist, hard when dry; clay films on faces of peds; pH 6.5; gradual boundary. 12 to 20 inches thick.

B3—33 to 42 inches, yellowish-red (5YR 5/6) loamy fine sand; yellowish red (5YR 4/6) when moist; weak, coarse, prismatic structure; gradual boundary. 6 to 14 inches thick.

C—42 to 50 inches +, yellowish-red (5YR 5/6) loamy sand; yellowish red (5YR 4/6) when moist; structureless; pH 7.0.

The texture of the A horizon is loamy fine sand, and the thickness ranges from 8 to 24 inches. The color is brown, dark brown, or reddish brown in hues of 5YR and 7.5YR. This horizon is slightly acid or neutral in reaction.

The texture of the B2t horizon is sticky loamy sand or sandy loam; the range in clay content is 12 to 17 percent. The color is reddish brown or reddish yellow. The reaction, or pH value, ranges from 6.6 to 7.3.

The texture of the C horizon is loamy fine sand to fine sand, and the color is reddish yellow or yellowish red.

Spur Series

The soils of the Spur series are azonal Alluvial soils of the bottom lands. These soils formed under tall grasses in recent calcareous alluvium.

The Spur soils in Greer County occur on flood plains of the major rivers and creeks and their tributaries. They are nearly level and are occasionally to seldom flooded.

The Spur soils are more clayey in the substratum than Sandy alluvial land and occur higher on the flood plain. They are more permeable and less clayey than the Mangum soils. They are more clayey and occur higher on the flood plain than the Yahola soils.

Typical profile of Spur loam, in a cultivated field located in the NW¼NE¼NE¼ sec. 31, T. 5 N., R. 20 W.

Ap—0 to 4 inches, brown (7.5YR 5/4) loam; dark brown (7.5YR 3/4) when moist; moderate, fine, granular structure; friable when moist, slightly hard when dry; calcareous; plowed boundary. 4 to 6 inches thick.

A12—4 to 14 inches, brown (7.5YR 5/4) loam; dark brown (7.5YR 3/4) when moist; moderate, medium, granular structure; friable when moist, slightly hard when dry; calcareous; gradual boundary. 8 to 12 inches thick.

AC—14 to 29 inches, reddish-brown (5YR 5/4) light silty clay loam; reddish brown (5YR 4/4) when moist; moderate, fine, subangular blocky structure; friable when moist, slightly hard when dry; calcareous; gradual boundary. 12 to 16 inches thick.

C—29 to 55 inches, reddish-brown (5YR 4/3) loam; dark reddish brown (5YR 3/3) when moist; structureless; friable when moist, slightly hard when dry; calcareous.

The thickness of the A horizon ranges from 12 to 18 inches. The texture is loam in most places but is clay loam, silt loam, or silty clay loam in some. The color is brown or dark brown.

The texture of the AC horizon is loam, clay loam, silt loam, or silty clay loam. The color is reddish brown.

The C horizon consists of weakly stratified clay loam, silt loam, loam, and silty clay loam. The color is reddish brown or yellowish red in a hue of 5YR. The texture of the uppermost 30 inches, below the plow layer, generally is loam or clay loam.

St. Paul Series

The soils of the St. Paul series are zonal Reddish Chestnut soils of the uplands. They formed under short and mid grasses in old alluvium or in material weathered from silty shale and sandstone of Permian age. They are well drained.

The St. Paul soils in Greer County are nearly level or gently sloping. They are extensive and occur mainly in the northern half of the county.

The St. Paul soils are more deeply leached of calcium carbonate than the Tillman, Hollister, Abilene, Carey, and La Casa soils. They have a less clayey B2t horizon and a more friable surface layer and subsoil than the Tillman soils. They have a less clayey B2t horizon and more reddish B3 and C horizons than the Hollister soils. The St. Paul soils are more reddish in the B horizon than the Abilene soils. They have more distinct horizons than the Carey soils and a more clayey and less reddish B2t horizon. The St. Paul soils have a less clayey A12 horizon than the La Casa soils. They are more alkaline and more silty than the Lawton soils.

Typical profile of St. Paul silt loam, in a cultivated field located in the NE¼NE¼NE¼ sec. 13, T. 6 N., R. 22 W.

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; very dark grayish brown (10YR 3/2) when moist; weak, fine, granular structure; friable when moist, slightly hard when dry; pH 7.0; plowed boundary. 4 to 6 inches thick.

A12—5 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; very dark brown (10YR 2/2) when moist; moderate, medium, granular structure; friable when moist, slightly hard when dry; worm casts; noncalcareous; pH 7.0; gradual boundary. 4 to 10 inches thick.

B1—12 to 18 inches, dark grayish-brown (10YR 4/2) silty clay loam; very dark brown (10YR 2/2) when moist; moderate, fine, subangular blocky structure; friable when moist, hard when dry; pH 7.5; gradual boundary. 5 to 8 inches thick.

B21t—18 to 35 inches, dark-brown (7.5YR 4/2) heavy silty clay loam; dark brown (7.5YR 3/2) when moist; moderate, fine or medium, blocky structure; firm when moist, hard when dry; clay films on faces of peds; pH 7.5; gradual boundary. 10 to 20 inches thick.

B22t—35 to 48 inches, reddish-brown (5YR 4/3) silty clay loam; dark reddish brown (5YR 3/3) when moist; moderate, coarse, blocky structure; firm when moist, hard when dry; calcareous; clay films on faces of peds; gradual boundary. 5 to 15 inches thick.

B3—48 to 58 inches, yellowish-red (5YR 5/6) clay loam; yellowish red (5YR 4/6) when moist; weak, blocky structure; firm when moist, hard when dry; calcareous; some small concretions of calcium carbonate; gradual boundary. 6 to 14 inches thick.

C—58 to 65 inches +, yellowish-red (5YR 5/6) clay loam; yellowish red (5YR 4/6) when moist; structureless; calcareous; few calcium carbonate concretions.

The texture of the A horizon is silt loam, and the thickness ranges from 8 to 16 inches. The color is brown, dark grayish brown, or reddish brown in hues of 5YR, 7.5YR, and 10YR. This horizon is neutral or mildly alkaline in reaction.

The texture of the B2t horizon is silty clay loam or clay loam. The color is dark brown or reddish brown in hues of 5YR and 7.5YR. The structure of the B horizon ranges from subangular blocky in the upper part to blocky in the lower part.

The texture of the C horizon is clay loam or silty clay loam, and the color is reddish yellow or yellowish red. This layer contains a few small, whitish concretions of calcium carbonate. The depth to calcareous material ranges from 25 to 45 inches.

Tarrant Series

The soils of the Tarrant series are azonal Lithosols of the uplands. These soils formed under mid and tall grasses in clayey Permian red beds that contained layers of dolomitic limestone.

The Tarrant soils in Greer County occupy gently sloping or sloping areas where dolomitic limestone crops out or lies within a few inches of the surface. They are in the western half of the county.

The Tarrant soils are less clayey than the Vernon soils, which formed in clayey shale and marine clay of the red beds. They are shallower and less clayey than the Weymouth soils. They formed from different parent material than the Cottonwood soils.

Typical profile of Tarrant loam, in a native pasture located in the SE¼SW¼ sec. 7, T. 3 N., R. 22 W.

A1—0 to 6 inches, dark-brown (7.5YR 4/2) heavy loam; dark brown (7.5YR 3/2) when moist; moderate, medium or fine, granular structure; friable when moist, hard when dry; calcareous; some fragments of dolomitic limestone, 6 inches in diameter, on the surface; abrupt boundary. 4 to 12 inches thick.

R—Consolidated bed of dolomitic limestone that cannot be penetrated with a sharpshooter shovel.

The texture of the A1 horizon is mainly loam, but it ranges from loam to stony loam or light clay loam. The color is brown or dark brown. Fragments of dolomitic limestone are scattered on the surface and make up 5 to 20 percent of the surface layer. They are 4 to 12 inches across and 1 to 4 inches thick. Consolidated beds of dolomitic limestone occur within 4 to 12 inches of the surface. These beds range from 6 to 48 inches in thickness, but the average thickness is about 20 inches.

Tillman Series

The soils of the Tillman series are zonal Reddish Chestnut soils of the uplands. These soils formed under short and mid grasses in marine clay and clayey shale of Permian age.

The Tillman soils in this county are nearly level or gently sloping. They are mainly south and east of Mangum and in the vicinity of Jester.

The Tillman soils resemble the Hollister soils, but they have a more reddish B horizon. They have a more clayey and more compact B2t horizon than the La Casa soils. They have a more clayey B2t horizon and are more alkaline than the Lawton soils. The Tillman soils are less deeply leached of calcium carbonate than the Abilene soils and have a more reddish, more clayey, and less friable B2t horizon. They have a more clayey B2t horizon and a less friable surface soil and subsoil than the St. Paul soils and are less deeply leached of calcium carbonate than those soils.

Typical profile of Tillman clay loam, in a cultivated field located in the SW¼SW¼SE¼ sec. 18, T. 3 N., R. 23 W.

Ap—0 to 5 inches, dark-brown (7.5YR 4/2) light clay loam; dark brown (7.5YR 3/2) when moist; weak, granular structure; friable when moist, slightly hard when dry; noncalcareous; pH 8.0; plowed boundary. 4 to 6 inches thick.

A12—5 to 8 inches, dark-brown (7.5YR 4/2) clay loam; dark brown (7.5YR 3/2) when moist; moderate, medium, granular structure; friable when moist, hard when dry; noncalcareous; pH 8.0; gradual boundary. 2 to 6 inches thick.

B1—8 to 15 inches, reddish-brown (5YR 4/3) heavy clay loam; dark reddish brown (5YR 3/3) when moist; moderate, medium, subangular blocky structure; friable when moist, hard when dry; noncalcareous; pH 8.0; clear boundary. 3 to 8 inches thick.

B21t—15 to 25 inches, reddish-brown (5YR 4/3) clay; dark reddish brown (5YR 3/3) when moist; moderate, medium, blocky structure; very firm when moist, very hard when dry; clay films on faces of peds; noncalcareous; pH 8.0; gradual boundary. 8 to 18 inches thick.

B22t—25 to 44 inches, reddish-brown (5YR 5/3) clay; reddish brown (5YR 4/3) when moist; moderate, medium, blocky structure; very firm when moist, very hard when dry; clay films on faces of peds; calcareous; some calcium carbonate concretions scattered throughout; gradual boundary. 7 to 20 inches thick.

Cca—44 to 60 inches +, yellowish-red (5YR 5/6) light clay; yellowish red (5YR 4/6) when moist; structureless; very firm when moist, very hard when dry; calcareous; some calcium carbonate concretions.

The texture of the A horizon is clay loam, and the thickness ranges from 6 to 10 inches. The color is reddish brown, dark brown, or brown in hues of 5YR and 7.5YR. The reaction, or pH value, ranges from 7.5 to 8.0.

The texture of the B2t horizon is light clay or clay, and the thickness ranges from 15 to 30 inches. The color is reddish brown or dark reddish brown. In a few areas the B1 horizon is very thin or absent. The upper part of the B horizon has subangular blocky structure; the lower part is blocky. The reaction is mildly alkaline or moderately alkaline.

The texture of the C horizon is clay loam or light clay, and the color is reddish brown or yellowish red. In most profiles the Cca horizon is present. The depth to calcareous material ranges from 15 to 30 inches.

Tipton Series

The soils of the Tipton series are zonal Reddish Chestnut soils. They formed under tall and mid grasses from calcareous old alluvium. They are well drained.

The Tipton soils in Greer County are on nearly level or gently sloping terraces along the North Fork and the Salt Fork of the Red River, mainly in the Hester vicinity.

The Tipton soils have less distinct horizons and a less clayey B2t horizon than the Abilene soils. They have a more silty and generally less reddish B2t horizon than the Miles soils and a more silty B2t horizon than the Altus soils. The Tipton soils have more distinct layers than the Enterprise soils, which lack a B2t horizon.

Typical profile of Tipton loam, in a cultivated field located in the SE¼NW¼SW¼ sec. 20, T. 4 N., R. 21 W.

Ap—0 to 6 inches, brown (7.5YR 5/2) loam; dark brown (7.5YR 3/2) when moist; weak, fine, granular structure; friable when moist, slightly hard when dry; noncalcareous; pH 7.5; plowed boundary. 4 to 8 inches thick.

A12—6 to 18 inches, dark-brown (7.5YR 4/2) loam; very dark brown (7.5YR 2/2) when moist; moderate, medium, granular structure; friable when moist, slightly hard when dry; many worm casts; noncalcareous; pH 7.5; gradual boundary. 6 to 14 inches thick.

B2t—18 to 39 inches, dark-brown (7.5YR 4/2) clay loam; dark brown (7.5YR 3/2) when moist; moderate, medium, prismatic structure; friable when moist, hard when dry; clay films on faces of peds; noncalcareous; pH 8.0; gradual boundary. 15 to 25 inches thick.

B3—39 to 50 inches, brown (7.5YR 5/4) light sandy clay loam; dark brown (7.5YR 4/4) when moist; weak, coarse, prismatic structure; friable when moist, slightly hard when dry; noncalcareous; pH 8.0; gradual boundary. 5 to 15 inches thick.

C—50 to 65 inches +, yellowish-red (5YR 5/6) loam; yellowish red (5YR 4/6) when moist; massive (structureless); calcareous.

The texture of the A horizon is loam, and the thickness ranges from 10 to 20 inches. The color is brown or dark brown. The reaction is neutral or mildly alkaline.

The texture of the B2t horizon ranges from heavy loam to clay loam, and the color is brown or dark brown. The B horizon ranges from granular to prismatic in structure and is mildly alkaline or moderately alkaline in reaction. The texture of the B3 horizon is heavy loam or light sandy clay loam. The color is brown, reddish brown, or yellowish red in hues of 5YR and 7.5YR.

The texture of the C horizon is loam. The color is yellowish red or reddish yellow. The depth to calcareous material ranges from 35 to 55 inches. At a depth below 5 feet, buried soils that are much older than the Tipton soils are common. Some waterworn pebbles may be scattered throughout the profile.

Tivoli Series

The soils of the Tivoli series are azonal Regosols of the uplands. They formed under tall grasses in windlaid sandy deposits. They are excessively drained. These soils are of minor extent in Greer County and are scattered throughout the sandy areas of the uplands.

The Tivoli soils are more sandy and more siliceous than the Enterprise soils. They have less distinct horizons than the Nobscot and Springer soils and lack a B2t horizon, which those soils have.

Typical profile of Tivoli fine sand, in a native pasture located in the NW¼NW¼ sec. 9, T. 4 N., R. 20 W.

A1—0 to 8 inches, brown (10YR 5/3) fine sand; dark brown (10YR 4/3) when moist; single grain (structureless); loose when moist and when dry; pH 6.5; gradual boundary. 6 to 9 inches thick.

C—8 to 60 inches +, reddish-yellow (5YR 6/6) fine sand; yellowish red (5YR 5/6) when moist; structureless; loose when moist and when dry; pH 7.0.

Two types of Tivoli soils are mapped in this county—fine sand, which is modal and the more extensive, and loamy fine sand. These soils range from slightly acid to mildly alkaline in reaction. The A horizon is about 8 inches thick and brown or dark brown in color. The loamy fine sand type has an AC horizon, about 7 inches thick, of brown or yellowish red loamy fine sand or fine sand. The texture of the C horizon is fine sand, and the color is yellowish red or reddish yellow. The reaction is neutral or mildly alkaline.

Treadway Series

The soils of the Treadway series are azonal Alluvial soils of the bottom lands. These soils formed under a sparse cover of short grasses in slightly weathered, clayey and loamy alluvium. They occur on alluvial fans, aprons, and flood plains below outcrops of Permian red beds.

The Treadway soils resemble the Mangum soils in color, texture, and reaction, but they have less well developed horizons, a lower content of organic matter, and slower permeability. The Treadway soils occur with Badland, but they are slightly better developed and generally less sloping.

Typical profile of a Treadway soil, in a native pasture located in the NW¼SW¼SW¼ sec. 2, T. 5 N., R. 22 W.

C1—0 to 15 inches, reddish-brown (5YR 5/3) clay loam; dark reddish brown (5YR 3/3) when moist; structureless; firm when moist; very hard when dry; calcareous; gradual boundary. 10 to 20 inches thick.

C2—15 to 40 inches +, reddish-brown (2.5YR 4/4) heavy clay loam; dark reddish brown (2.5YR 3/4) when moist; massive (structureless); hard when dry; calcareous.

The texture of the C1 horizon is clay or clay loam, and the color is reddish brown. The lower part of the C horizon has massive structure and a clay loam or clay texture. The color is reddish brown or yellowish red.

Vernon Series

The soils of the Vernon series are azonal Lithosols of the uplands. These soils formed under mid and short grasses in clayey shales and marine clays of the Permian red beds. They are extensive in Greer County and occur in strongly sloping or moderately steep areas scattered throughout the county.

The Vernon soils are more clayey than the Tarrant soils, which formed from clayey red beds that contained layers of dolomitic limestone. The Vernon soils are more clayey than the Cottonwood and Quinlan soils. They are more clayey, less permeable, and less deep than the Weymouth soils and contain less calcium carbonate.

Typical profile of a Vernon soil, in a native pasture located in the SW¼SW¼SW¼ sec. 20, T. 7 N., R. 22 W.

A1—0 to 6 inches, reddish-brown (5YR 5/3) light clay; dark reddish brown (5YR 3/3) when moist; weak, granular structure; firm when moist, very hard when dry; calcareous; clear boundary. 4 to 10 inches thick.

AC—6 to 16 inches, reddish-brown (2.5YR 5/4) clay; dark reddish brown (2.5YR 3/4) when moist; weak, granular structure; very firm when moist, extremely hard when

dry; calcareous; gradual boundary. 0 to 15 inches thick.

R—16 to 25 inches +, reddish-brown (2.5YR 4/4), compact, calcareous, massive (structureless) clay.

The texture of the A horizon ranges from light clay loam to clay, and the color is reddish brown or brown. The texture of the AC horizon is clay loam or clay. The color is red or reddish brown. The depth to unweathered, laminated shale or clay ranges from 4 to 25 inches, but it generally is 16 inches.

Weymouth Series

The soils of the Weymouth series are intrazonal Calcisols of the uplands. These soils formed under mid grasses in clayey Permian red beds that were high in calcium carbonate. In Greer County these soils occur in gently sloping to moderately steep areas throughout the clayey red beds.

The Weymouth soils generally occur with the Vernon soils, but they have more distinct and thicker horizons than those soils and contain more calcium carbonate deeper in the profile. They have a more reddish AC horizon than the Acme soils and lack a Ccs horizon. The Weymouth soils are more clayey than the Enterprise and Woodward soils. They have more reddish and less grayish A and AC horizons than the Mansic soils.

Typical profile of Weymouth clay loam, in a native pasture located in the NW¼SW¼NW¼ sec. 24, T. 5 N., R. 23 W.

A1—0 to 11 inches, dark-brown (7.5YR 4/2) light clay loam; dark brown (7.5YR 3/2) when moist; moderate, fine, granular structure; friable when moist, hard when dry; calcareous; worm casts; gradual boundary. 3 to 16 inches thick.

AC—11 to 21 inches, reddish-brown (5YR 5/4) clay loam; dark reddish brown (5YR 3/4) when moist; moderate, medium, granular structure; friable when moist, hard when dry; calcareous; a few small concretions of calcium carbonate; worm casts; gradual boundary. 8 to 16 inches thick.

Cca—21 to 41 inches, yellowish-red (5YR 5/6) clay loam; yellowish red (5YR 4/6) when moist; weak, medium or fine, subangular blocky structure; friable when moist, very hard when dry; strongly calcareous; many small, hard concretions of calcium carbonate. 10 to 24 inches thick.

C—41 to 60 inches +, yellowish-red (5YR 5/6) clay loam; yellowish red (5YR 4/6) when moist; structureless; firm when moist, very hard when dry; calcareous; some hard calcium carbonate concretions, the number decreasing with depth.

The texture of the A horizon is light clay loam or medium clay loam. The color is reddish brown, brown, or dark brown.

The texture of the AC horizon is clay loam, and the color is reddish brown. The texture of the Cca horizon, which most profiles have, is clay loam. The color is yellowish red or reddish yellow. Calcium carbonate concretions make up 10 to 40 percent of the mass; the average is about 15 percent.

The texture of the C horizon is medium to heavy clay loam. The color is similar to that of the Cca horizon, but the percentage of calcium carbonate concretions is less and generally decreases with depth.

Woodward Series

The soils of the Woodward series are intrazonal Chestnut soils that intergrade toward Regosols. These soils formed under tall and mid grasses in weakly consolidated, calcareous sandstone of the Permian red beds. In Greer County they are in gently sloping to moderately steep areas of the uplands. The main areas are in the northern half of the county.

The Woodward soils have more distinct and thicker horizons than the Quinlan soils. They are less clayey than the Weymouth soils. They have less grayish A and AC horizons and are less clayey than the Mansic soils. The Woodward soils are slightly more clayey and more reddish than the Enterprise soils. They have less distinct and thinner horizons than the Carey soils, with which they are associated.

Typical profile of Woodward loam, in a cultivated field located in the NW¼NE¼NW¼ sec. 21, T. 7 N., R. 24 W.

Ap—0 to 6 inches, reddish-brown (5YR 4/4) loam; dark reddish brown (5YR 3/4) when moist; weak, fine, granular structure; very friable when moist, slightly hard when dry; noncalcareous; pH 8.0; plowed boundary. 4 to 8 inches thick.

A12—6 to 11 inches, reddish-brown (5YR 4/4) loam; dark reddish brown (5YR 3/4) when moist; moderate, fine, granular structure; friable when moist, slightly hard when dry; noncalcareous, but spots of lime occur; pH 8.0; gradual boundary. 4 to 10 inches thick.

AC—11 to 26 inches, reddish-brown (2.5YR 5/4) loam; reddish brown (2.5YR 4/4) when moist; weak, coarse, prismatic structure, breaking to medium, granular; friable when moist, hard when dry; worm casts; calcareous; calcium carbonate visible in seams between prisms; gradual boundary. 10 to 18 inches thick.

R—26 to 40 inches +, red (2.5YR 5/6) loam; red (2.5YR 4/6) when moist; structureless; soft, fine-grained packsand; calcareous; a few visible blotches of calcium carbonate.

The texture of the A horizon is loam, and the thickness ranges from 8 to 18 inches. The color is reddish brown or brown. The reaction is mildly alkaline or moderately alkaline.

The texture of the AC horizon is loam, and the color is reddish brown, brown, or yellowish red. The structure is granular or prismatic.

The R horizon consists of slightly altered sandstone. The color is red or yellowish red. In a few areas this weakly consolidated horizon is made up of alternating red and gray layers of sandstone. The depth to calcareous material ranges up to 18 inches.

Yahola Series

The soils of the Yahola series are azonal Alluvial soils of the bottom lands. These soils formed under tall grasses in calcareous recent sandy alluvium. The Yahola soils in Greer County occur on flood plains of the major rivers and are subject to occasional flooding.

The Yahola soils are more sandy and are lower on the flood plain than the nearby Spur soils. They have a thicker A horizon and a less sandy substratum than Sandy alluvial land and occur higher on the flood plain. The Yahola soils are more sandy and more friable than the Mangum soils.

Typical profile of Yahola fine sandy loam, in a cultivated field located in the NW¼NW¼NW¼ sec. 6, T. 3 N., R. 21 W.

Ap—0 to 9 inches, brown (7.5YR 5/4) fine sandy loam; dark brown (7.5YR 3/4) when moist; moderate, fine, granular structure; very friable when moist, soft when

dry; calcareous; plowed boundary. 5 to 10 inches thick.

AC—9 to 36 inches, reddish-brown (5YR 5/4) fine sandy loam; reddish brown (5YR 4/4) when moist; weak, granular structure; very friable when moist, soft when dry; calcareous; clear boundary. 10 to 30 inches thick.

C1—36 to 43 inches, light reddish-brown (5YR 6/4) loamy very fine sand; reddish brown (5YR 4/4) when moist; structureless to weak, platy; loose when moist, loose when dry; thinly stratified with redder, siltier strata; calcareous; abrupt boundary. 5 to 10 inches thick.

C2—43 to 60 inches +, pink (5YR 7/4) sand; reddish brown (5YR 5/4) when moist; structureless; loose when moist and when dry; calcareous.

The texture of the A horizon is fine sandy loam, and the thickness ranges from 5 to 10 inches. The color is brown or dark brown.

The texture of the AC horizon is fine sandy loam, and the color is reddish brown or yellowish red. Normally, the AC horizon is stratified.

The C horizon consists of many layers; the texture is loamy fine sand, sandy loam, sand, and, in a few areas, clay loam. The average texture of the upper 30 inches is fine sandy loam. In the upper 30 inches, below the plow layer, the clay content ranges from 12 to 20 percent. The color of the C horizon is pink to reddish brown.

General Nature of the County

Greer County was organized in 1886 by an act of the Texas Legislature. It was a part of the State of Texas until 1896, when the United States Supreme Court decreed that it belonged under the jurisdiction of the Oklahoma Territory. On January 18, 1897, Congress opened the county for settlement. Under the Homestead Act of 1893, each settler was allowed 160 acres for a homestead. Those who had an additional 160 acres in their possession at the time the Act was passed had the opportunity to purchase the acreage. The first residents lived in dugouts until lumber could be hauled for building houses.

In the early period of ranching, the range was free and unfenced. Between 1890 and 1900, there was a great influx of settlers; then general farming began, and fences were put up.

For many years, the rural population was evenly distributed throughout the county. Now, the trend is for more farmers to live in towns. The number of farms, as well as the rural population, is decreasing. Between 1930 and 1959, the number of farms decreased from 2,455 to 791.

Land Use and Types of Farming

Agriculture began in the 1880's, when ranchers from Texas brought cattle into the area to graze. Late in the 1890's, cotton farmers immigrated and began to break the sod for farming. The main crops were cotton, corn, grain sorghum, and wheat. Now, wheat and cotton predominate, and grain sorghum and alfalfa are next. Alfalfa is grown for seed, as well as for hay. Other crops are oats, barley, rye, cowpeas, peanuts, guar, sweetclover, and sudangrass.

About 169,000 acres is in native grassland, and there are many temporary pastures. When wheat is available for pasture, many cattle are brought in to graze. Livestock accounts for about one-third of the total farm income.

Irrigation is not extensive in Greer County. In 1961, between 10,000 and 11,000 acres was irrigated.

Natural Resources and Industry

In the eastern part of the county, near the Wichita Mountains, commercial companies excavate granitic gravel of high quality for use in surfacing roads. A monument works is located near Granite. On the Elm Fork of the Red River, south of Granite, a company obtains sand and gravel of high quality for use in surfacing roads and for making concrete. A few other pits scattered throughout the county could supply gravel and sand, but these generally are small and have not been developed.

There are a few gas and oil wells in the extreme northwestern and northeastern parts of the county, next to Beckham County.

In the western half of the county is a considerable amount of gypsum. No commercial companies are working this resource at present.

Water Supply

Wells and ponds are the sources of water in Greer County. Most of the water for irrigation and for municipal and domestic use comes from wells. Farm ponds equipped with windmills provide most of the water for livestock. Also available for livestock are waters of the North, Elm, and Salt Forks of the Red River.

Climate [11]

The climate of Greer County is subhumid, temperate, and continental. The major climatic variations are caused by the alternating movement of warm, moist air from the Gulf of Mexico and cool, dry air from the north. Daily and seasonal changes in temperature, cloudiness, wind, and precipitation are often sudden and extreme.

The seasons are well defined. They vary in severity from year to year, but changes between the seasons are gradual. Normally, winters are mild and sunny, and cold spells last only 2 to 4 days before southerly winds return. The most violent weather and the greatest frequency of severe storms and tornadoes occur in spring. As a result, most of the rain falls during this season, when it is of maximum benefit to growing crops. Summers are long and rather hot, but winds and low humidity help to relieve discomfort caused by the heat. Fall brings an increase in rainfall that is timely for fall crops and pasture. Days are pleasant, and nights are cool and bracing.

Table 8, compiled from records of the United States Weather Bureau at Mangum, Okla., gives temperature and precipitation data typical of the county. The average annual temperature is 62 degrees, and the average monthly temperature ranges from 39.7 degrees in January to 83.9 degrees in July. An average variation in

[11] Prepared with the assistance of STANLEY G. HOLBROOK, State climatologist, U.S. Weather Bureau.

TABLE 8.—*Temperature and precipitation data at Mangum, Greer County, Okla., for years 1931–60*

[Elevation 1,590 feet]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°F.	°F.	°F.	°F.	Inches	Inches	Inches	Number	Inches
January	53.0	26.3	72	10	0.98	0.1	2.2	3	2
February	56.9	30.6	74	16	.92	(1)	2.2	2	2
March	65.3	36.3	84	21	1.21	(1)	3.0	2	3
April	75.6	47.5	90	34	2.42	.5	4.7	2	3
May	82.9	57.1	96	45	4.89	1.2	10.0	0	
June	92.8	66.2	104	58	2.70	.5	5.1	0	
July	97.6	70.1	105	64	2.19	.2	5.8	0	
August	97.4	69.2	107	63	2.03	.2	4.6	0	
September	89.3	61.4	100	48	2.06	(1)	4.7	0	
October	78.3	50.5	92	37	2.39	.1	6.3	0	
November	64.0	36.1	78	24	.84	0	2.3	0	
December	55.1	29.6	72	18	1.05	(1)	2.6	5	3
Year	75.7	48.4	(2) 108	(3) 4	23.68	15.5	31.0	14	3

[1] Trace.
[2] Average annual highest maximum.
[3] Average annual lowest minimum.

daily temperature of 27.3 degrees makes the climate stimulating but not inclement.

The average annual precipitation for the period 1931–60 was 23.68 inches. Annual amounts have ranged from as little as 10.86 inches in 1910 to as much as 45.13 inches in 1923. The greatest amount recorded in any one month was 15.75 inches in October 1923; the greatest amount in one day, 6.15 inches, fell on October 13, 1923.

The average annual snowfall ranges from 6.5 inches in the southeastern part of the county to almost 8.5 inches in the northwestern part. A measurable amount of snow was recorded at Mangum in all but 4 of the last 70 winters, dating back to 1893–94. The greatest seasonal snowfall was 20.0 inches, during the 1923–24 season.

The prevailing wind most of the year is from the south, but it is from the northwest in winter. The hourly windspeed during the year averages about 13 miles per hour. It ranges from 16 miles per hour during March and April to 10 miles per hour during July and August. Winds of 25 to 40 miles per hour, with gusts up to 80 miles per hour, are associated with violent squalls and severe thunderstorms that are most common in spring. Tornadoes are dreaded most, but only 12 have been recorded in Greer County since 1875.

The rate of moisture evaporation in summer is high. The average annual evaporation from lakes is about 65.5 inches, of which 68.3 percent occurs between the first of May and the end of October. Sometimes the small amount of rainfall received in July and August evaporates so rapidly that crops receive no benefit from it.

Except for local variations due to irregular topography, the average length of the growing season ranges from 209 days in the northwestern part to 225 days in the southeastern part. The latest date in spring that a temperature of 32 degrees or less has been recorded was May 1, 1909; the earliest date in fall was October 8, 1952. The growing season generally is adequate for crops to mature. Table 9 shows the probabilities of freezing temperatures after specified dates in spring and before specified dates in fall.

TABLE 9.—*Probability of freezing temperatures in spring and fall*

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	March 18	March 25	March 31	April 7	April 19
2 years in 10 later than	March 10	March 19	March 26	April 2	April 13
5 years in 10 later than	February 22	March 6	March 18	March 24	April 3
Fall:					
1 year in 10 earlier than	November 30	November 21	November 5	November 1	October 22
2 years in 10 earlier than	December 7	November 28	November 12	November 5	October 27
5 years in 10 earlier than	December 19	December 12	November 26	November 14	November 4

Glossary

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity. The capacity of a soil to hold water in a form available to plants. The amount of moisture held in a soil between field capacity, or about one-third atmosphere of tension, and the wilting point, or about 15 atmospheres of tension.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; soil will not hold together in a mass.

Friable.—When moist, soil crushes easily under gentle to moderate pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, soil crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, soil is readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky.—When wet, soil adheres to other material and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard.—When dry, soil is moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, soil breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

Forb. Any herbaceous plant, neither a grass nor a sedge, that is grazed on western ranges.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Relative terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils generally indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of three simple variables—hue, value, and chroma. Hue is the dominant spectral color; value relates to the relative lightness of color; chroma is the relative purity or strength of color and increases as grayness decreases. For example, the notation 10YR 6/4 stands for a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material (soil). The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Plowpan. A compacted layer formed in the soil immediately below the plow layer.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Range (or rangeland). Land that, for the most part, produces native plants suitable for grazing by livestock; includes land on which there are some forest trees.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Runoff (hydrology). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz, but they may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief, over periods of time.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer beneath the solum, or true soil.

Surface layer. A term used in nontechnical soil descriptions for one or more upper layers of soil. Includes the A horizon and part of the B horizon; has no depth limit.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and generally are wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. (See also Clay, Sand, and Silt.) The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

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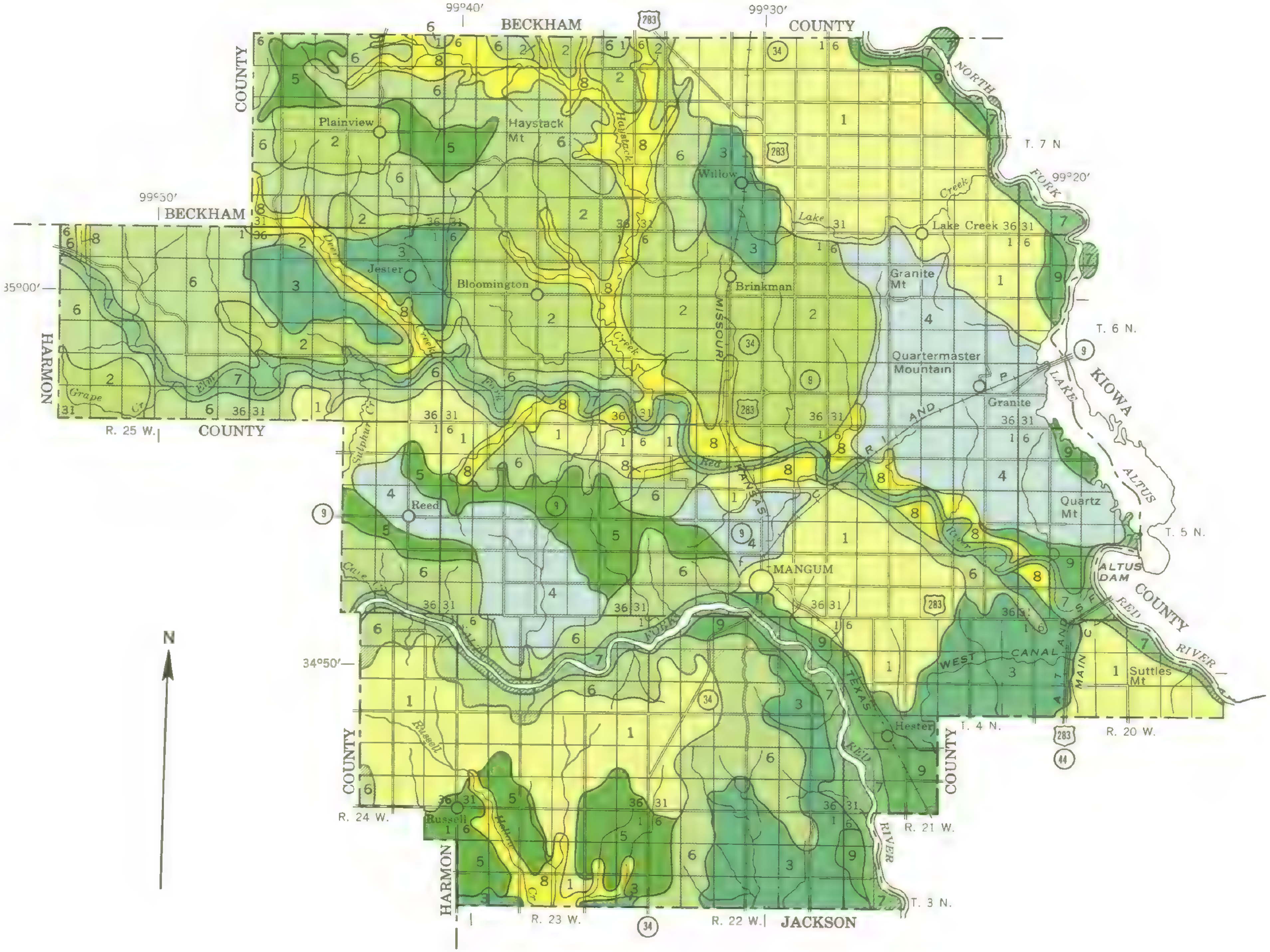
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
OKLAHOMA AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
GREER COUNTY, OKLAHOMA

Scale 1 : 253,440

1 0 1 2 3 4 Miles



SOIL ASSOCIATIONS

1 Miles-Springer-Tivoli association: Nearly level to strongly sloping soils of the uplands that formed in material blown from old alluvium

2 St. Paul-Woodward-Quinlan association: Nearly level to steep soils of the uplands that formed in old alluvium or in material from sandstone

3 Hollister-Tillman association: Nearly level soils of the broad uplands that formed in old alluvium or in material from clay and shale

4 Lawton association: Nearly level to steep soils of the uplands that formed in material from granitic outwash

5 La Casa-Weymouth association: Gently sloping and sloping soils of the uplands that formed in material from calcareous shale and clay

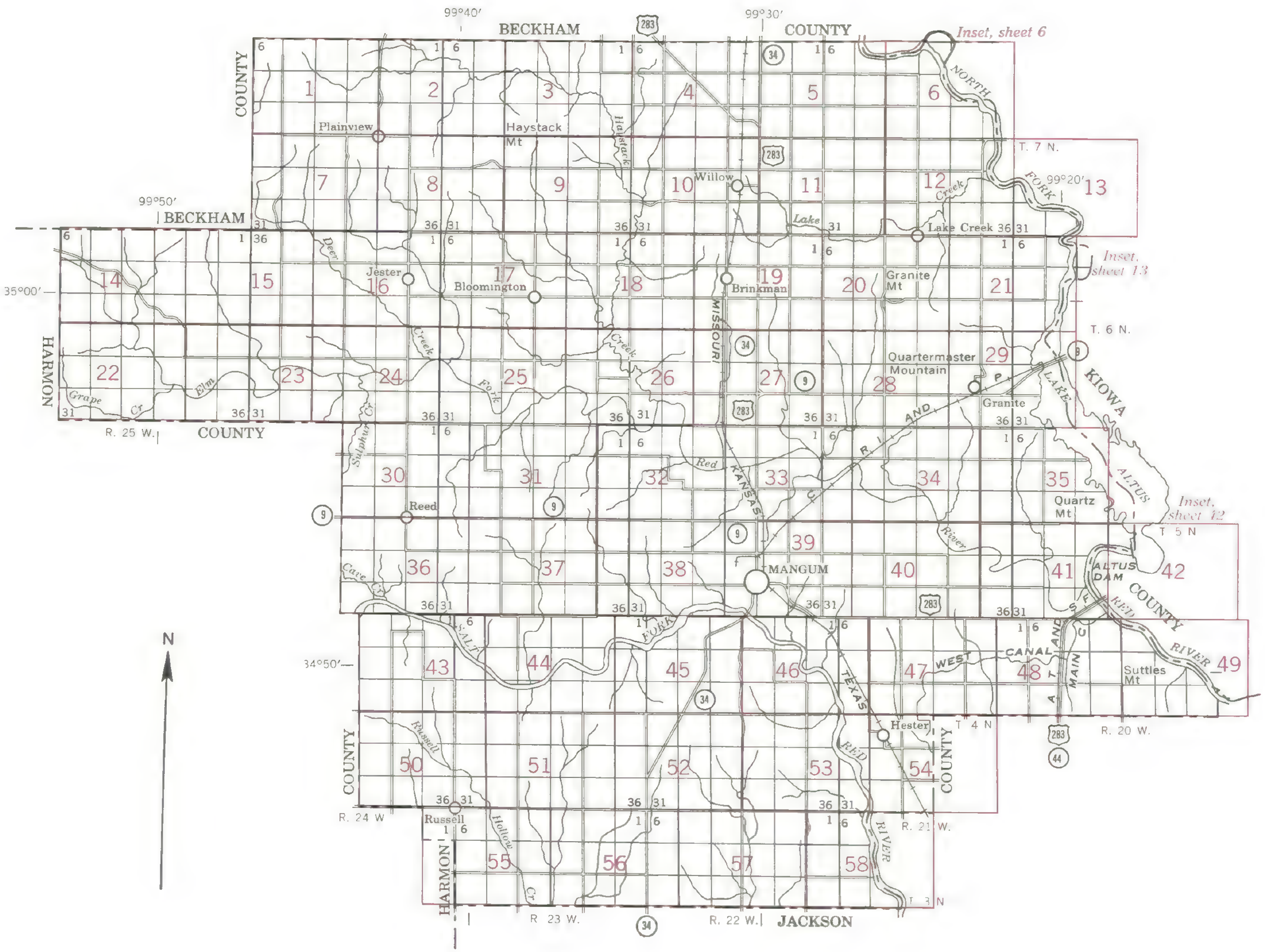
6 Badland-Rough broken land association: Gently sloping to steep, rough breaks of the uplands

7 Sandy alluvial land-Yahola association: Nearly level soils of the flood plains that formed in sandy alluvium washed from soils of the prairies

8 Spur-Mangum association: Nearly level soils of the flood plains that formed in loamy and clayey alluvium washed from soils of the uplands

9 Tipton-Enterprise association: Nearly level to strongly sloping soils of the terraces that formed in alluvium or wind-deposited material

May 1966



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GREER COUNTY, OKLAHOMA

Scale 1:253,440

1 0 1 2 3 4 Miles

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F shows the slope. Most symbols without a slope letter are those of soils or land types that are nearly level, but some are for soils or land types that have a considerable range of slope. A final number, 2, in the symbol shows that the soil is eroded.

SYMBOL	NAME
AbA	Abilene clay loam, 0 to 1 percent slopes
AcB	Acme clay loam, 1 to 3 percent slopes
At	Altus fine sandy loam
Ba	Badland
[illegible]	Carey loam, 1 to 3 percent slopes
[illegible]	Cottonwood—Acme complex
EnA	Enterprise very fine sandy loam, 0 to 1 percent slopes
EnB	Enterprise very fine sandy loam, 1 to 3 percent slopes
[illegible]	Enterprise very fine sandy loam, 3 to 5 percent slopes
EnD	Enterprise very fine sandy loam, 5 to 8 percent slopes
Er	Eroded sandy land
HcA	Hollister clay loam, 0 to 1 percent slopes
[illegible]	La Casa clay loam, 1 to 3 percent slopes
[illegible]	Lawton loam, 0 to 1 percent slopes
[illegible]	Lawton loam, 1 to 3 percent slopes
[illegible]	Lawton loam, 3 to 5 percent slopes, eroded
[illegible]	Lawton gravelly complex, 3 to 8 percent slopes
[illegible]	Mangum clay
[illegible]	Mansic clay loam, 0 to 1 percent slopes
[illegible]	Meno and Altus loamy fine sands
[illegible]	Miles fine sandy loam, 3 to 5 percent slopes
[illegible]	Miles fine sandy loam, 3 to 5 percent slopes, eroded
[illegible]	Miles and Altus fine sandy loams, 0 to 1 percent slopes
[illegible]	Miles and Altus fine sandy loams, 1 to 3 percent slopes
[illegible]	Miles and Brownfield soils, 0 to 3 percent slopes
[illegible]	Nobscot fine sand, 0 to 5 percent slopes
[illegible]	Nobscot fine sand, 5 to 12 percent slopes
[illegible]	Quinlan loam, 8 to 20 percent slopes
[illegible]	Quinlan—Woodward loams, 3 to 5 percent slopes, eroded
[illegible]	Quinlan—Woodward loams, 5 to 12 percent slopes
[illegible]	Rock outcrop
[illegible]	Rough broken land
[illegible]	Sandy alluvial land
[illegible]	Sandy broken land
[illegible]	Springer loamy fine sand, 0 to 3 percent slopes
[illegible]	Springer loamy fine sand, 3 to 8 percent slopes
[illegible]	Spur clay loam
[illegible]	Spur loam
[illegible]	Spur soils, channeled
SpA	St. Paul silt loam, 0 to 1 percent slopes
[illegible]	St. Paul silt loam, 1 to 3 percent slopes
[illegible]	Tillman clay loam, 0 to 1 percent slopes
[illegible]	Tillman clay loam, 1 to 3 percent slopes
TpA	Tipton loam, 0 to 1 percent slopes
TpB	Tipton loam, 1 to 3 percent slopes
[illegible]	Tivoli fine sand
Tw	Tivoli loamy fine sand
[illegible]	Treadway soils
VeE	Vernon soils, 5 to 12 percent slopes
[illegible]	Vernon—Weymouth complex, 10 to 20 percent slopes
[illegible]	Wet alluvial land
[illegible]	Weymouth clay loam, 1 to 3 percent slopes
[illegible]	Weymouth clay loam, 3 to 5 percent slopes
[illegible]	Weymouth clay loam, 3 to 5 percent slopes, eroded
[illegible]	Weymouth—Tarrant complex, 0 to 5 percent slopes
[illegible]	Woodward loam, 1 to 3 percent slopes
[illegible]	Woodward loam, 3 to 5 percent slopes
[illegible]	Woodward—Quinlan loams, 3 to 5 percent slopes
[illegible]	Yahola fine sandy loam

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferries
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mines and Quarries

Mine dump

Pits, gravel or other

Power lines

Pipe lines

Cemeteries

Dams

Levees

Tanks

Oil wells

BOUNDARIES

National or state

County

Township, U. S.

Section line, corner

Reservation

Land grant

DRAINAGE

Streams
- Perennial
- Intermittent, unclass.

Canals and ditches — CANAL, DITCH

Lakes and ponds
- Perennial
- Intermittent

Wells — flowing

Springs

Marsh

Wet spot

Alluvial fan

Drainage ends

Flume

RELIEF

Escarpments
- Bedrock
- Other

Prominent peaks

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

Soil boundary and symbol — Dx

Gravel

Stones

Rock outcrops

Chert fragments

Clay spot

Sand spot

Gumbo or scabby spot

Made land

Severely eroded spot

Blowout, wind erosion

Gullies

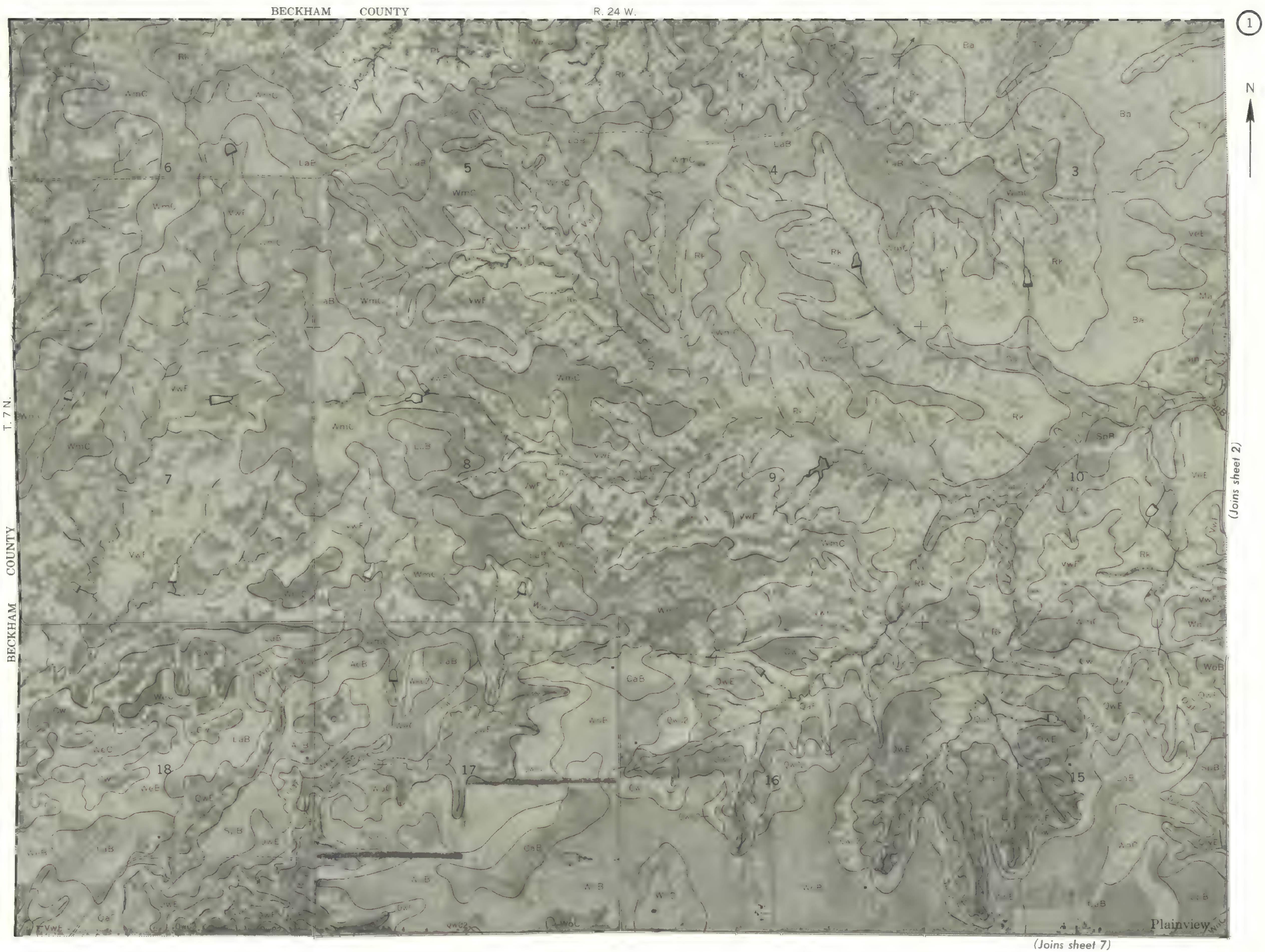
Soil map constructed 1966 by Cartographic Division, Soil Conservation Service, USDA, from 1957 aerial photographs. Controlled mosaic based on Oklahoma plane coordinate system, south zone, Lambert conformal conic projection, 1927 North American datum.

GUIDE TO MAPPING UNITS

[See table 1, p. 7, for approximate acreage and proportionate extent of soils and table 2, p. 34, for estimates of crop yields. See pp. 40 and 41 for information about wildlife and pp. 41 to 54 for information about engineering]

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page	Range site Name	Range site Page	Windbreak group Number	Windbreak group Page
AbA	Abilene clay loam, 0 to 1 percent slopes	8	IIc-1	29	Hardland	36	4	39
AcB	Acme clay loam, 1 to 3 percent slopes	8	IIIe-1	29	Loamy Prairie	36	4	39
At	Altus fine sandy loam	9	IIe-2	28	Sandy Prairie	35	1	39
Ba	Badland	9	VIIs-1	32	Eroded Red Clay	37	5	40
CaB	Carey loam, 1 to 3 percent slopes	10	IIe-1	28	Loamy Prairie	36	4	39
Cw	Cottonwood-Acme complex	10	-----	--	----------	--	-	--
	Cottonwood soil	--	VIIs-2	32	Gyp	37	5	40
	Acme soil	--	VIIs-2	32	Loamy Prairie	36	5	40
EnA	Enterprise very fine sandy loam, 0 to 1 percent slopes	10	IIc-1	29	Loamy Prairie	36	2	39
EnB	Enterprise very fine sandy loam, 1 to 3 percent slopes	11	IIe-1	28	Loamy Prairie	36	2	39
EnC	Enterprise very fine sandy loam, 3 to 5 percent slopes	11	IIIe-2	29	Loamy Prairie	36	4	39
EnD	Enterprise very fine sandy loam, 5 to 8 percent slopes	11	IVe-5	30	Loamy Prairie	36	5	40
Er	Eroded sandy land	11	VIe-2	31	Eroded Sandy Land	37	5	40
HcA	Hollister clay loam, 0 to 1 percent slopes	12	IIc-1	29	Hardland	36	4	39
LaB	La Casa clay loam, 1 to 3 percent slopes	12	IIe-1	28	Hardland	36	4	39
LtA	Lawton loam, 0 to 1 percent slopes	13	IIc-1	29	Loamy Prairie	36	4	39
LtB	Lawton loam, 1 to 3 percent slopes	13	IIe-1	28	Loamy Prairie	36	4	39
LtC2	Lawton loam, 3 to 5 percent slopes, eroded	13	IVe-4	30	Loamy Prairie	36	5	40
LvD	Lawton gravelly complex, 3 to 8 percent slopes	13	VIe-3	31	Loamy Prairie	36	5	40
Ma	Mangum clay	14	IIIs-1	30	Heavy Bottom Land	35	5	40
McA	Mansic clay loam, 0 to 1 percent slopes	14	IIc-1	29	Loamy Prairie	36	4	39
Me	Meno and Altus loamy fine sands	15	IIIe-4	29	Deep Sand	36	1	39
MfC	Miles fine sandy loam, 3 to 5 percent slopes	15	IIIe-3	29	Sandy Prairie	35	4	39
MfC2	Miles fine sandy loam, 3 to 5 percent slopes, eroded	15	IVe-6	31	Sandy Prairie	35	4	39
MuA	Miles and Altus fine sandy loams, 0 to 1 percent slopes	15	IIe-2	28	Sandy Prairie	35	1	39
MuB	Miles and Altus fine sandy loams, 1 to 3 percent slopes	15	IIIe-3	29	Sandy Prairie	35	1	39
MwB	Miles and Brownfield soils, 0 to 3 percent slopes	16	-----	--	----------	--	-	--
	Miles soil	--	IIIe-4	29	Deep Sand	36	1	39
	Brownfield soil	--	IIIe-4	29	Deep Sand Savannah	36	1	39
NoC	Nobscot fine sand, 0 to 5 percent slopes	16	IVe-7	31	Deep Sand Savannah	36	4	39
NoD	Nobscot fine sand, 5 to 12 percent slopes	17	VIe-4	31	Deep Sand Savannah	36	4	39
QaF	Quinlan loam, 8 to 20 percent slopes	17	VIe-5	32	Shallow Prairie	36	5	40
QwC2	Quinlan-Woodward loams, 3 to 5 percent slopes, eroded	17	-----	--	----------	--	-	--
	Quinlan soil	--	IVe-4	30	Shallow Prairie	36	5	40
	Woodward soil	--	IVe-4	30	Loamy Prairie	36	5	40
QwE	Quinlan-Woodward loams, 5 to 12 percent slopes	17	-----	--	----------	--	-	--
	Quinlan soil	--	VIe-6	32	Shallow Prairie	36	5	40
	Woodward soil	--	VIe-6	32	Loamy Prairie	36	5	40
Rc	Rock outcrop	18	VIIs-4	32	Granite Hills	37	5	40
Rk	Rough broken land	18	VIIs-5	33	Breaks	37	5	40
Sa	Sandy alluvial land	18	Vw-1	31	Sandy Bottom Land	35	5	40
Sb	Sandy broken land	18	VIe-1	31	Sandy Prairie	35	5	40
SgB	Springer loamy fine sand, 0 to 3 percent slopes	19	IIIe-4	29	Deep Sand	36	1	39
SgD	Springer loamy fine sand, 3 to 8 percent slopes	19	IVe-7	31	Deep Sand	36	4	39
Sm	Spur clay loam	19	IIw-1	28	Loamy Bottom Land	35	3	39
Sn	Spur loam	19	IIw-1	28	Loamy Bottom Land	35	3	39
So	Spur soils, channeled	20	Vw-2	31	Loamy Bottom Land	35	5	40
SpA	St. Paul silt loam, 0 to 1 percent slopes	20	IIc-1	29	Hardland	36	4	39
SpB	St. Paul silt loam, 1 to 3 percent slopes	20	IIe-1	28	Hardland	36	4	39
TcA	Tillman clay loam, 0 to 1 percent slopes	21	IIs-1	29	Hardland	36	4	39
TcB	Tillman clay loam, 1 to 3 percent slopes	21	IIIe-1	29	Hardland	36	4	39
TpA	Tipton loam, 0 to 1 percent slopes	21	I-1	28	Loamy Prairie	36	2	39
TpB	Tipton loam, 1 to 3 percent slopes	22	IIe-1	28	Loamy Prairie	36	2	39
Tv	Tivoli fine sand	22	VIIe-1	32	Dune	37	5	40
Tw	Tivoli loamy fine sand	22	VIe-7	32	Deep Sand	36	5	40
Ty	Treadway soils	23	VIs-1	32	Red Clay Flats	37	5	40
VeE	Vernon soils, 5 to 12 percent slopes	23	VIe-8	32	Red Clay Prairie	37	5	40
VwF	Vernon-Weymouth complex, 10 to 20 percent slopes	23	-----	--	----------	--	-	--
	Vernon soil	--	VIIs-3	32	Red Clay Prairie	37	5	40
	Weymouth soil	--	VIIs-3	32	Hardland	36	5	40
Wa	Wet alluvial land	23	Vw-3	31	Subirrigated	35	5	40
WeB	Weymouth clay loam, 1 to 3 percent slopes	24	IIIe-1	29	Hardland	36	4	39
WeC	Weymouth clay loam, 3 to 5 percent slopes	24	IVe-1	30	Hardland	36	5	40
WeC2	Weymouth clay loam, 3 to 5 percent slopes, eroded	24	IVe-2	30	Hardland	36	5	40
WmC	Weymouth-Tarrant complex, 0 to 5 percent slopes	25	-----	--	----------	--	-	--
	Weymouth soil	--	VIs-2	32	Hardland	36	5	40
	Tarrant soil	--	VIs-2	32	Shallow Prairie	36	5	40
WoB	Woodward loam, 1 to 3 percent slopes	25	IIe-1	28	Loamy Prairie	36	4	39
WoC	Woodward loam, 3 to 5 percent slopes	25	IIIe-2	29	Loamy Prairie	36	4	39
WwC	Woodward-Quinlan loams, 3 to 5 percent slopes	25	-----	--	----------	--	-	--
	Woodward soil	--	IVe-3	30	Loamy Prairie	36	5	40
	Quinlan soil	--	IVe-3	30	Shallow Prairie	36	5	40
Ya	Yahola fine sandy loam	26	IIw-2	29	Loamy Bottom Land	35	3	39

217-361 O - 67 (Face p. 72)



Scale 1: 20 000

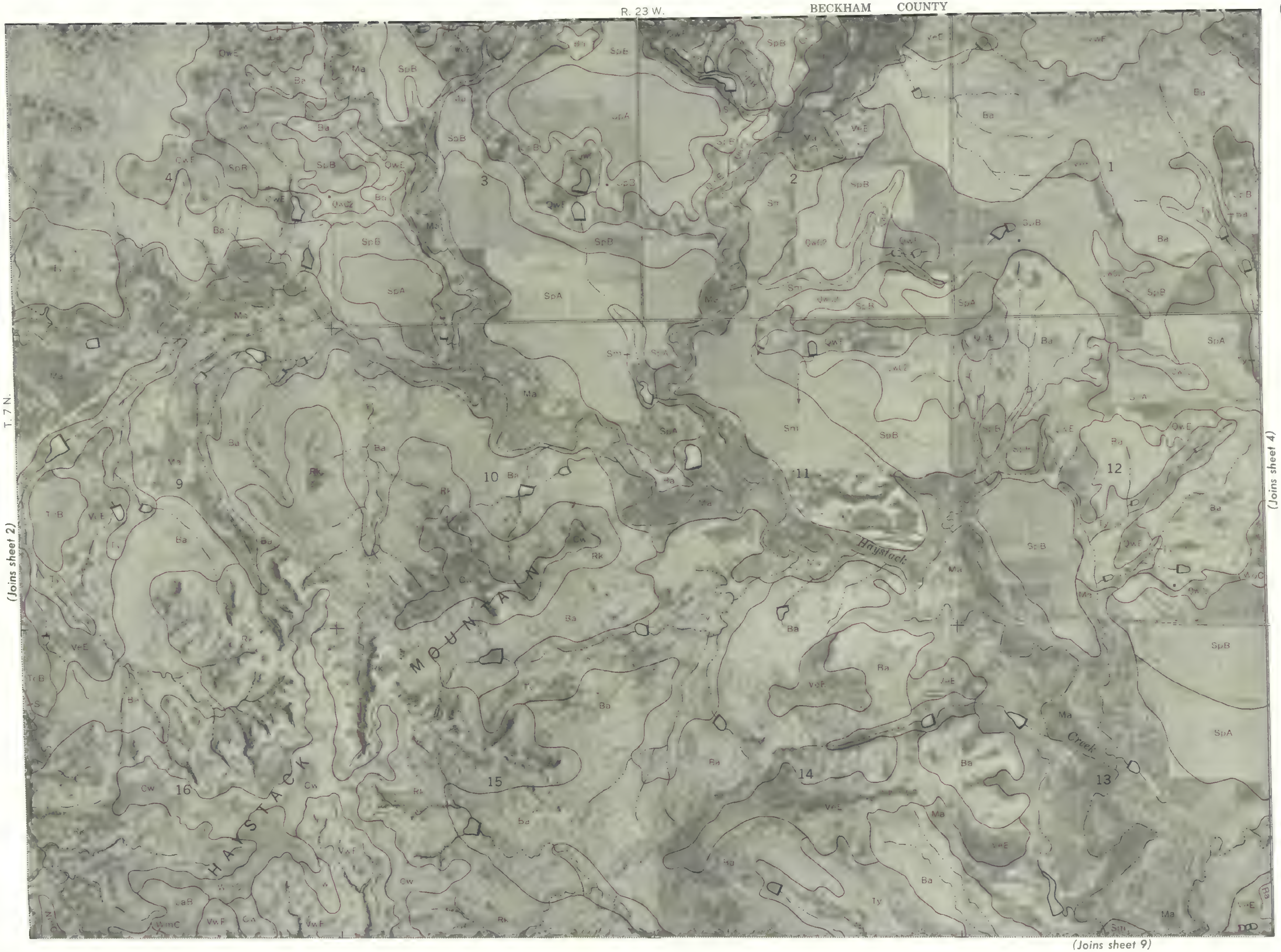
0 ½ 1 Mile

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.


2
N
R. 24 W. | R. 23 W.
BECKHAM COUNTY
T. 7 N.
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 8)
Plainview
Haystack
Creek
Scale 1: 20 000
0
½
1 Mile
0
5000 Feet



0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

4

Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.


6
N
(Joins lower right)
R. 21 W.
(Joins sheet 5)
(Joins sheet 12)
BECKHAM COUNTY
NORTH FORK RED RIVER
KIOWA COUNTY
R. 21 W.
T. 8 N.
T. 7 N.
(Joins upper left)
34
35
3
10
11
12
13
14
SgB
SgD
MwB
MwA
NoC
Tv
Sa
EnA
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet

R. 24 W.

(Joins sheet 1)

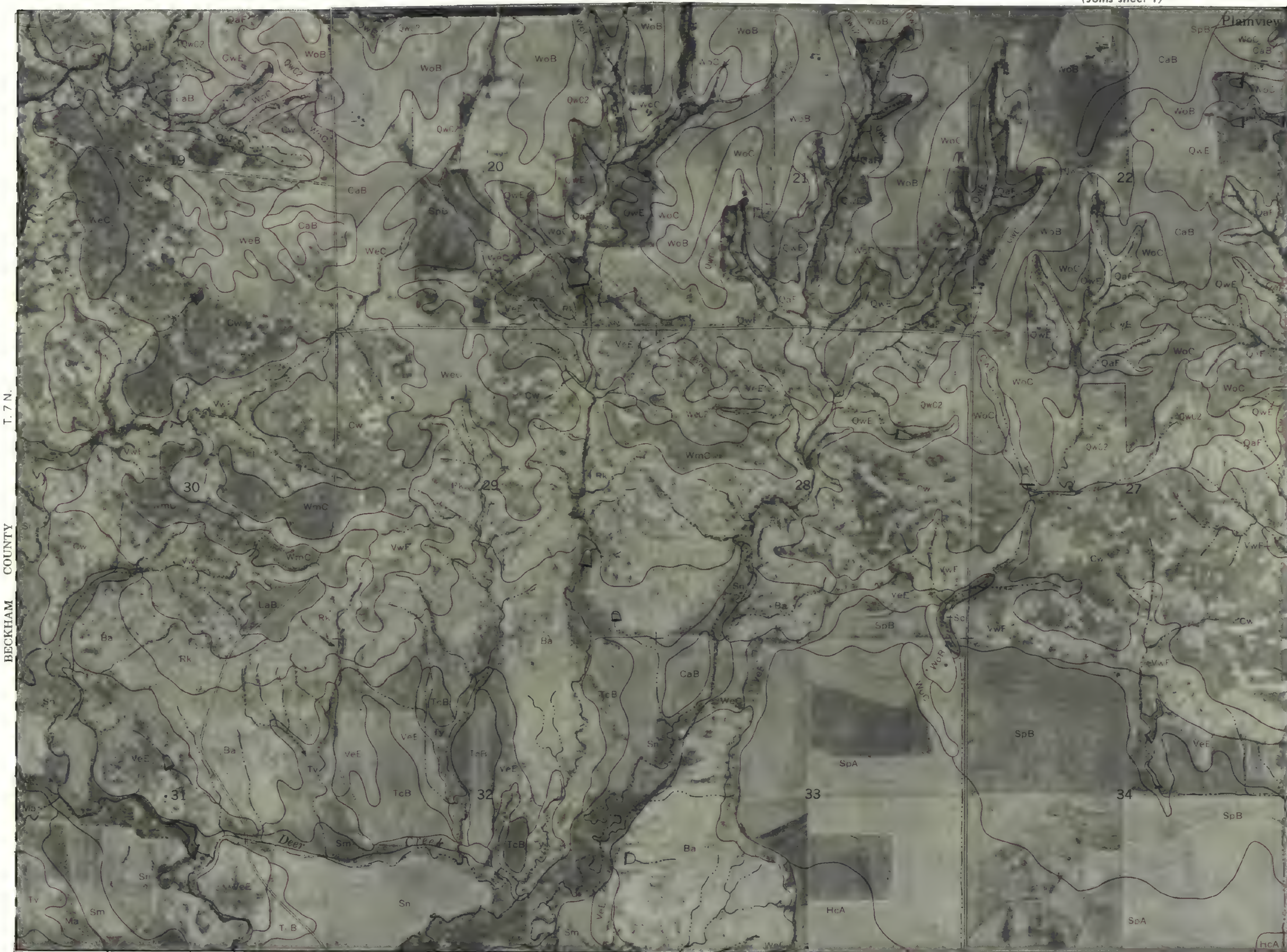
7

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

T. 7 N.

BECKHAM COUNTY



N

(Joins sheet 8)

(Joins sheet 15) | (Joins sheet 16)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

8

(Joins sheet 2)

R. 24 W. | R. 23 W.

(Joins sheet 7)

T. 7 N.

(Joins sheet 9)

(Joins sheet 16) | (Joins sheet 17)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

This map is one of a set compiled in 1956 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

10

(Joins sheet 4) R. 22 W.

N

(Joins sheet 9)

T. 7 N.

(Joins sheet 11)

(Joins sheet 18) | (Joins sheet 19)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

R. 22 W. | R. 21 W.

(Joins sheet 5)

11

N

T. 7 N.

(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 19) | (Joins sheet 20)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station

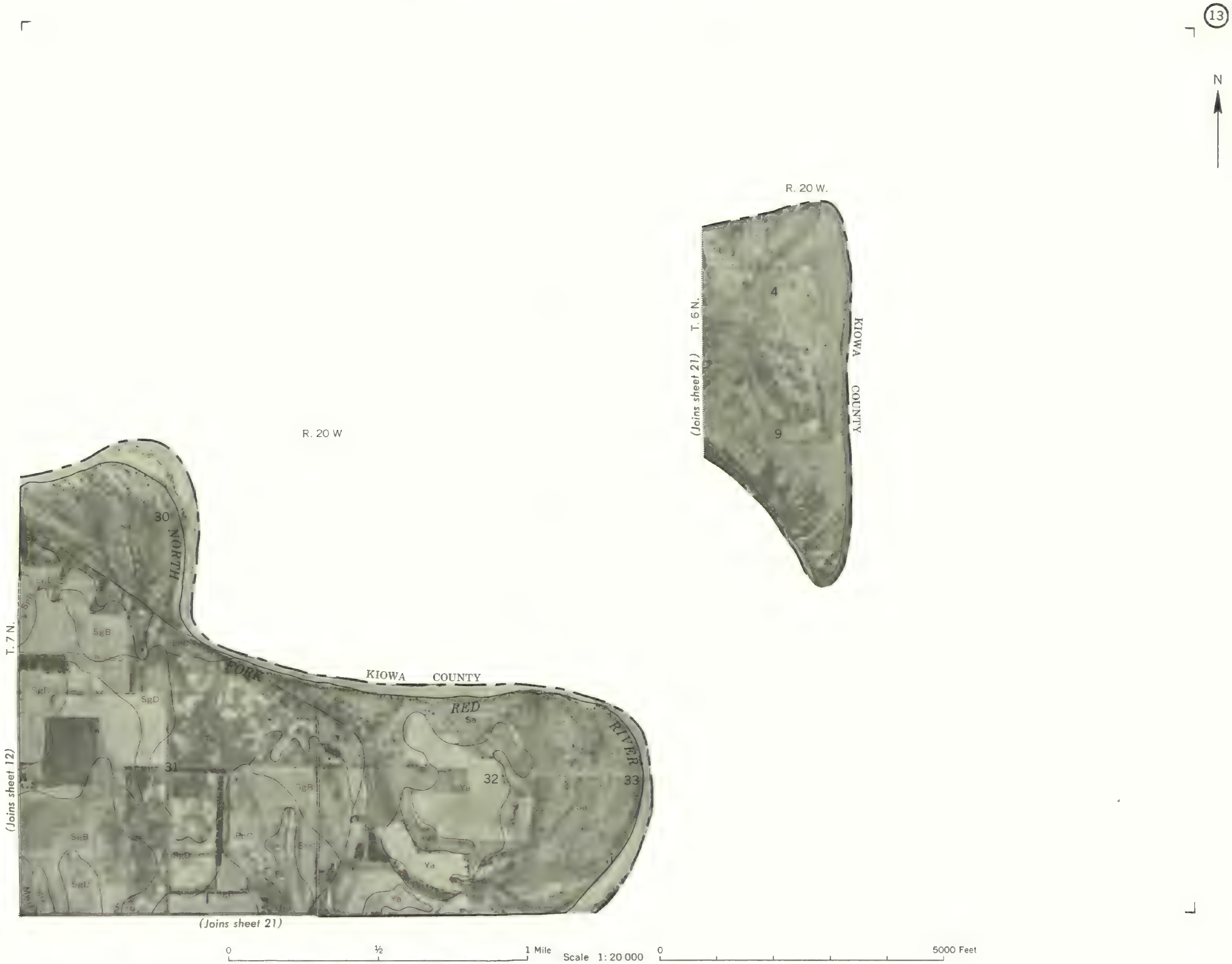
Range, township, and section corners shown on this map are indefinite.

GREER COUNTY, OKLAHOMA — SHEET NUMBER 12

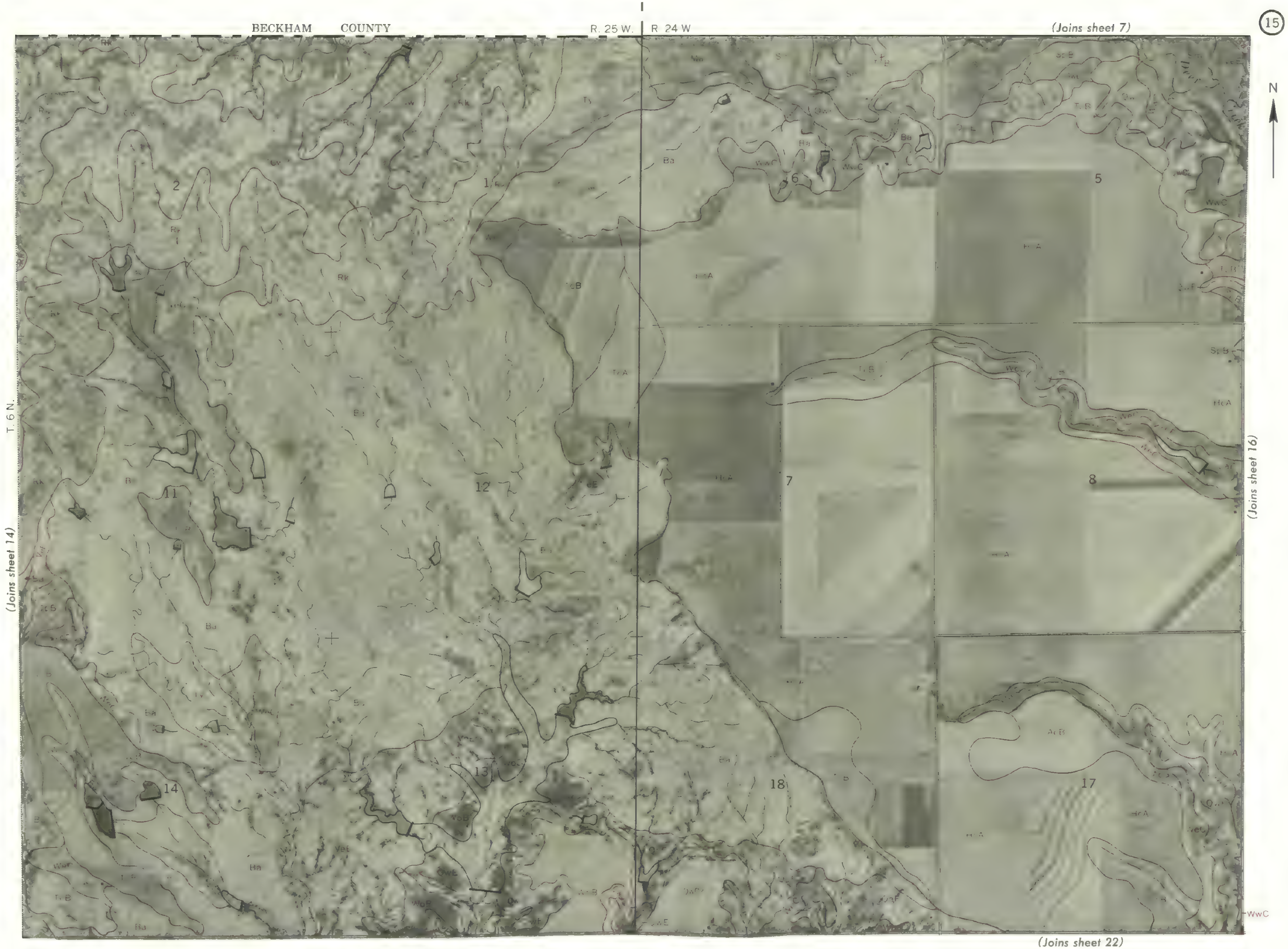
0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station

Range, township, and section corners shown on this map are indefinite.




14
BECKHAM COUNTY
HARMON COUNTY
N
R. 25 W.
T. 6 N.
(Joins sheet 15)
(Joins sheet 22)
ELM FORK
RED RIVER
0 ½ 1 Mile
Scale 1: 20 000
0 5000 Feet



0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

16


(Joins sheet 7)
(Joins sheet 8)
R. 24 W
N
(Joins sheet 15)
(Joins sheet 17)
T. 6 N.
(Joins sheet 24)
Deer Creek Church
Jester
HcA
SpB
SpA
TcB
QwE
WwC
WeC
AcB
Sm
1
2
3
4
9
10
11
12
13
14
15
16
0
½
1 Mile
Scale 1:20 000
0
5000 Feet

(Joins sheet 8) | (Joins sheet 9) R. 23 W.

17

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station

Range, township, and section corners shown on this map are indefinite.


18
N
R. 23 W.
(Joins sheet 9)
(Joins sheet 10)
R. 22 W.
(Joins sheet 17)
T. 6 N.
(Joins sheet 19)
(Joins sheet 26)
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

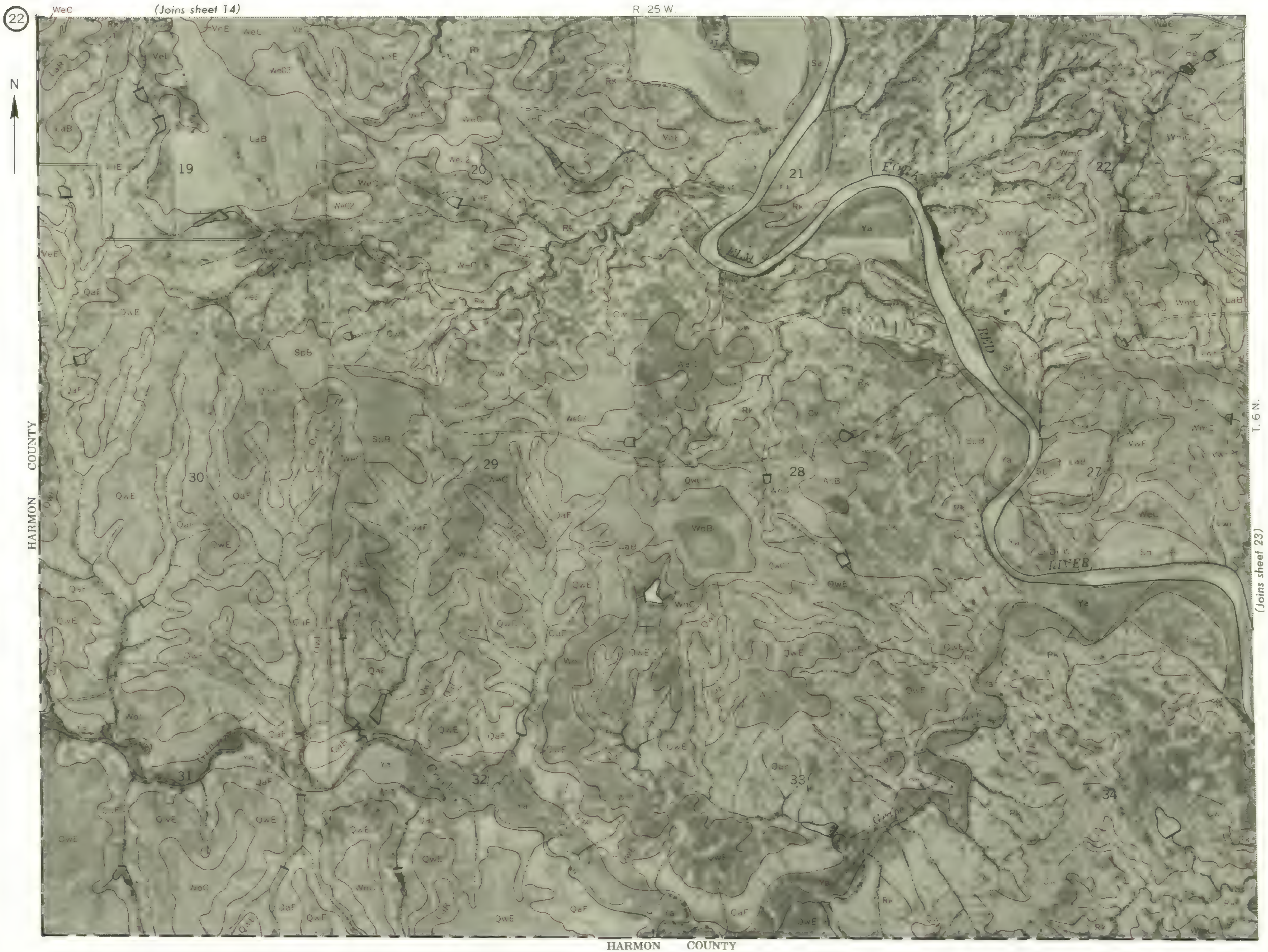

20
N
(Joins sheet 11)
(Joins sheet 12)
R 21 W
Lake Creek
(Joins sheet 19)
T. 6 N.
(Joins sheet 21)
GRANITE MOUNTAINS
OKLAHOMA STATE REFORMATORY
6
5
4
3
7
8
9
10
18
17
16
15
(Joins sheet 28)
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet

GREER COUNTY, OKLAHOMA — SHEET NUMBER 21

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet



0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

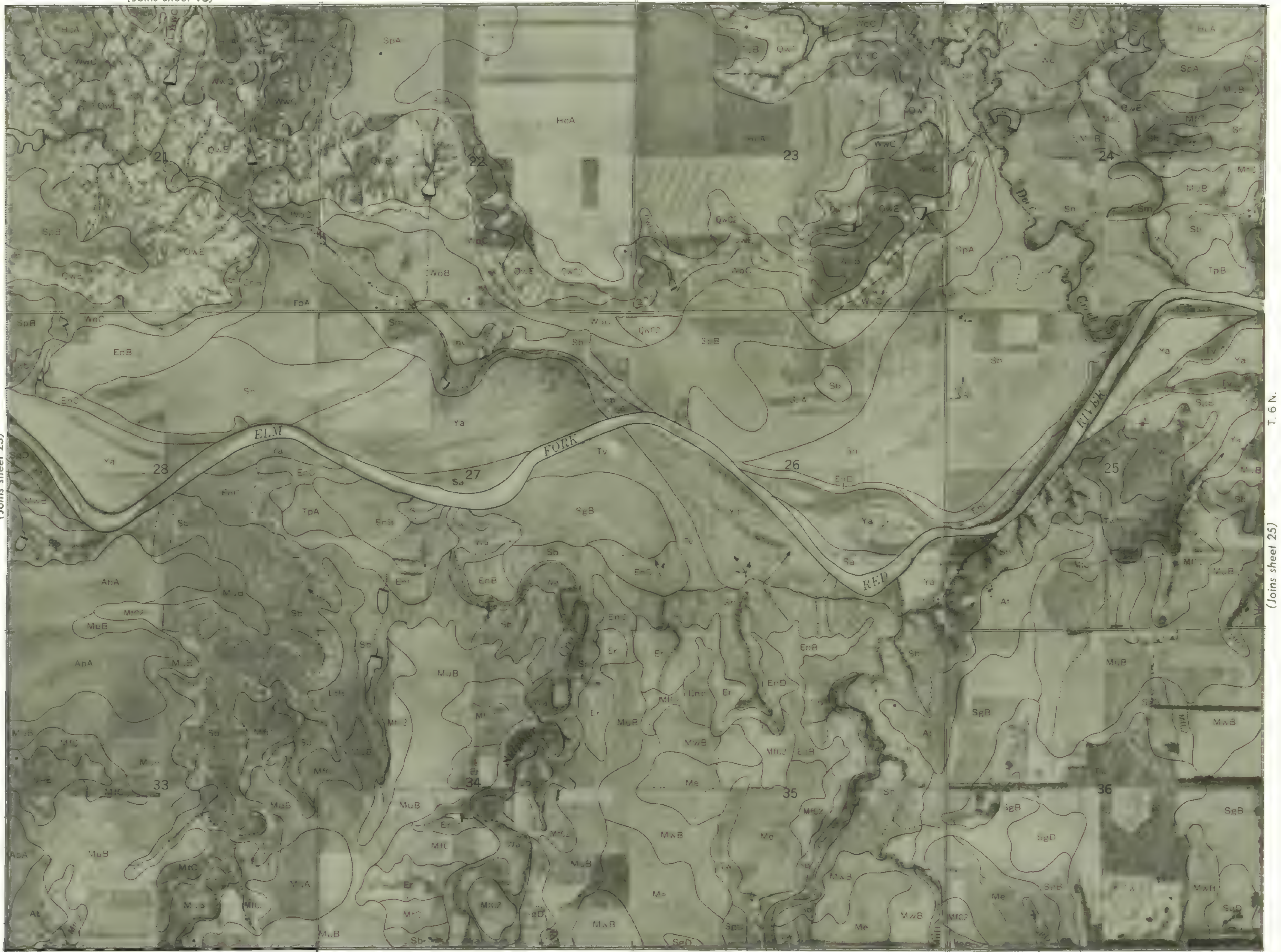
24

(Joins sheet 16)

R. 24 W.

N

(Joins sheet 23)



T. 6 N.

(Joins sheet 25)

HARMON COUNTY

(Joins sheet 30)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

26

(Joins sheet 18)

R. 23 W. | R. 22 W.

N

(Joins sheet 25)

T. 6 N.

(Joins sheet 27)

SpB

MuB

(Joins sheet 31) | (Joins sheet 32)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

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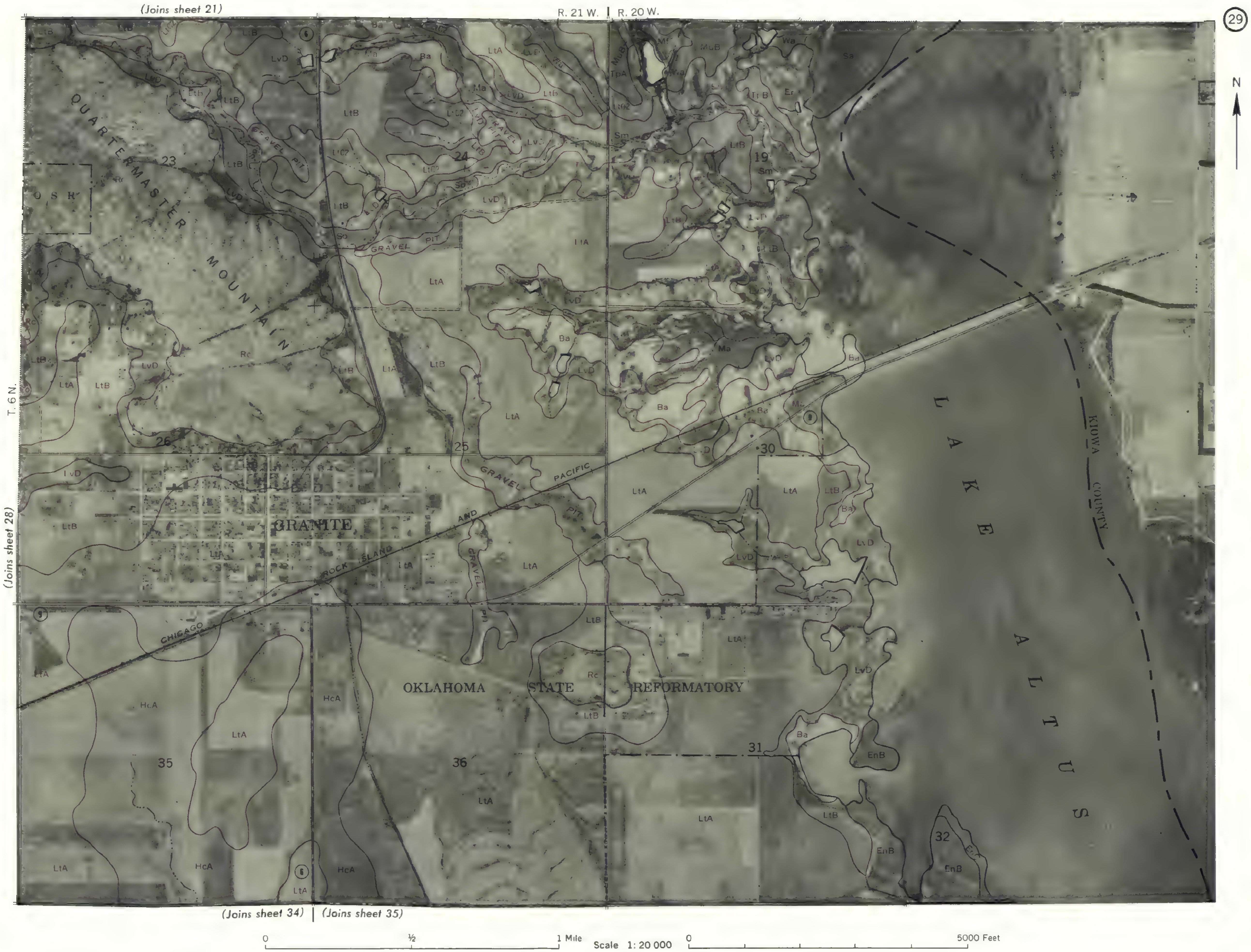
Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

(Joins sheet 20)

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.



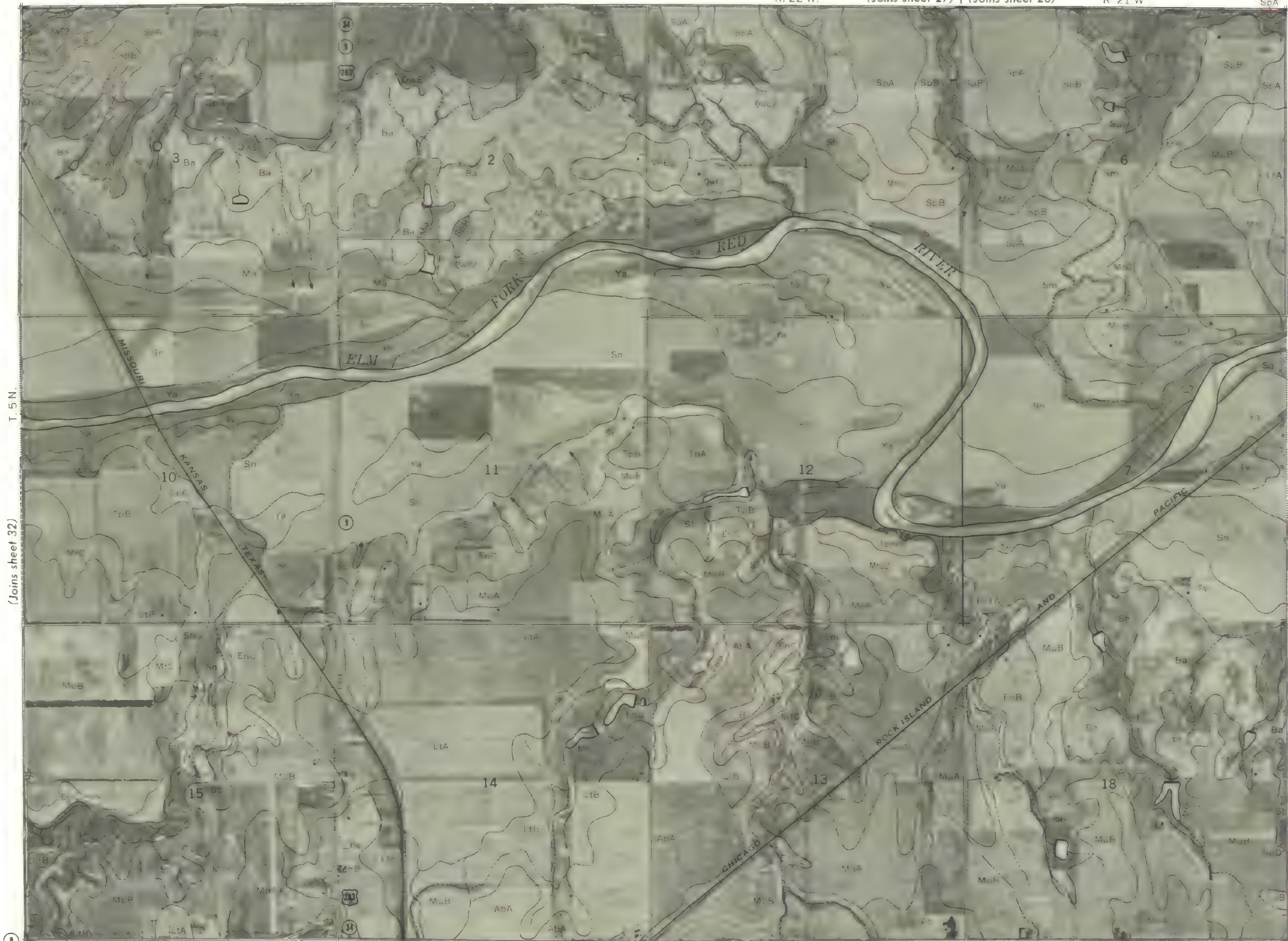

30
N
R. 24 W.
(Joins sheet 24)
(Joins sheet 25)
R. 23 W.
T. 5 N.
(Joins sheet 31)
HARMON COUNTY
(Joins sheet 36)
Reed
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet

(Joins sheet 25) | (Joins sheet 26)

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.


32
R. 23 W.
R. 22 W.
(Joins sheet 26)
(Joins sheet 27)
N
ELM FORK RED RIVER
ELM FORK RED RIVER
T. 5 N.
(Joins sheet 31)
(Joins sheet 33)
(Joins sheet 38)
LaB
WwC
SpB
SpA
TpA
MuB
Sn
Ya
Ba
LtB
TcB
1
4
5
6
7
8
9
12
13
16
17
18
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet



This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet


34
N
R. 21 W.
(Joins sheet 28)
(Joins sheet 29)
(Joins sheet 33)
T. 5 N.
(Joins sheet 35)
(Joins sheet 40)
CHICAGO
ROCK ISLAND
AND
PACIFIC
ELM
FORK
RIVER
5
4
3
2
8
9
10
11
17
14
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

Scale 1:20 000

0 ½ 1 Mile

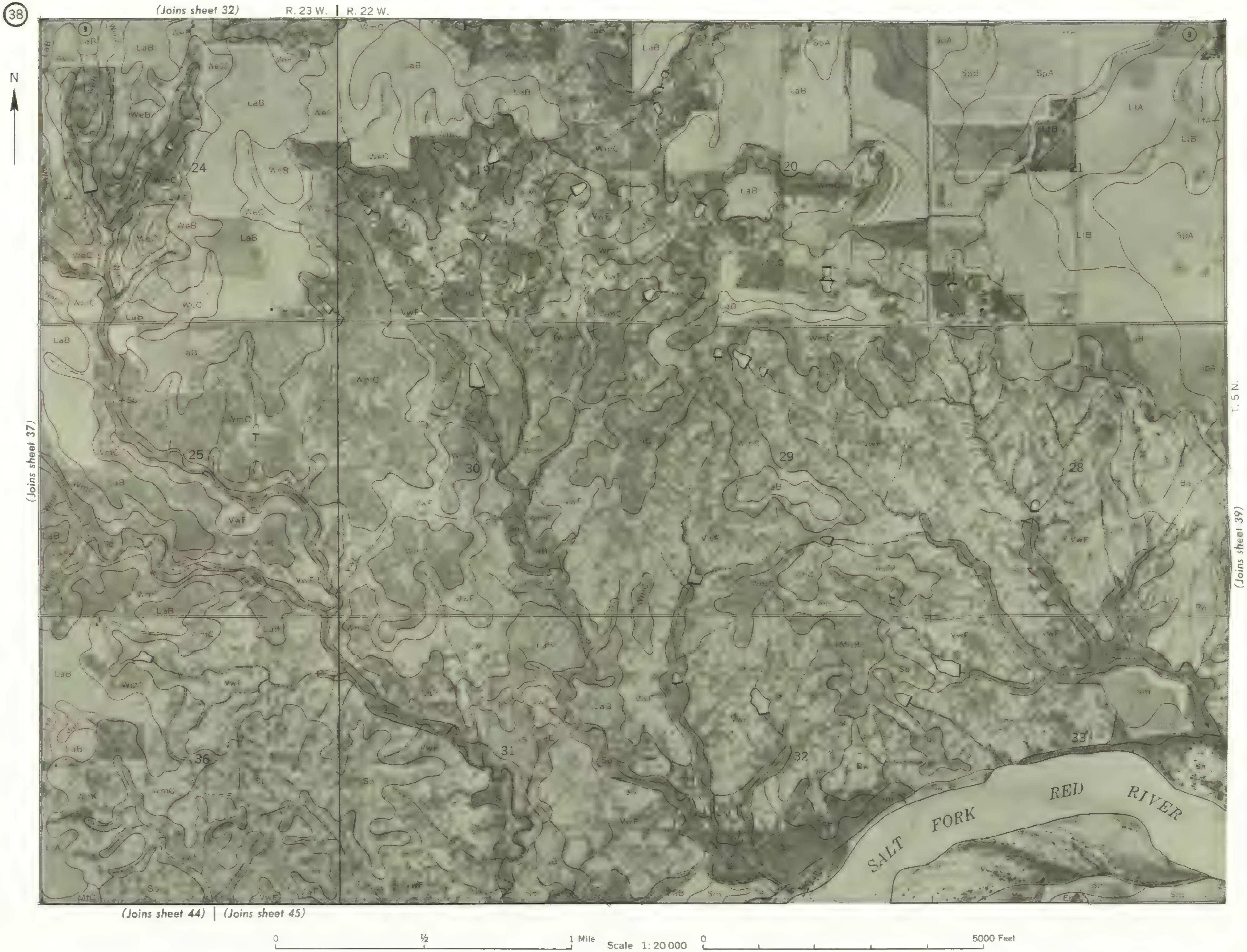
0 5000 Feet

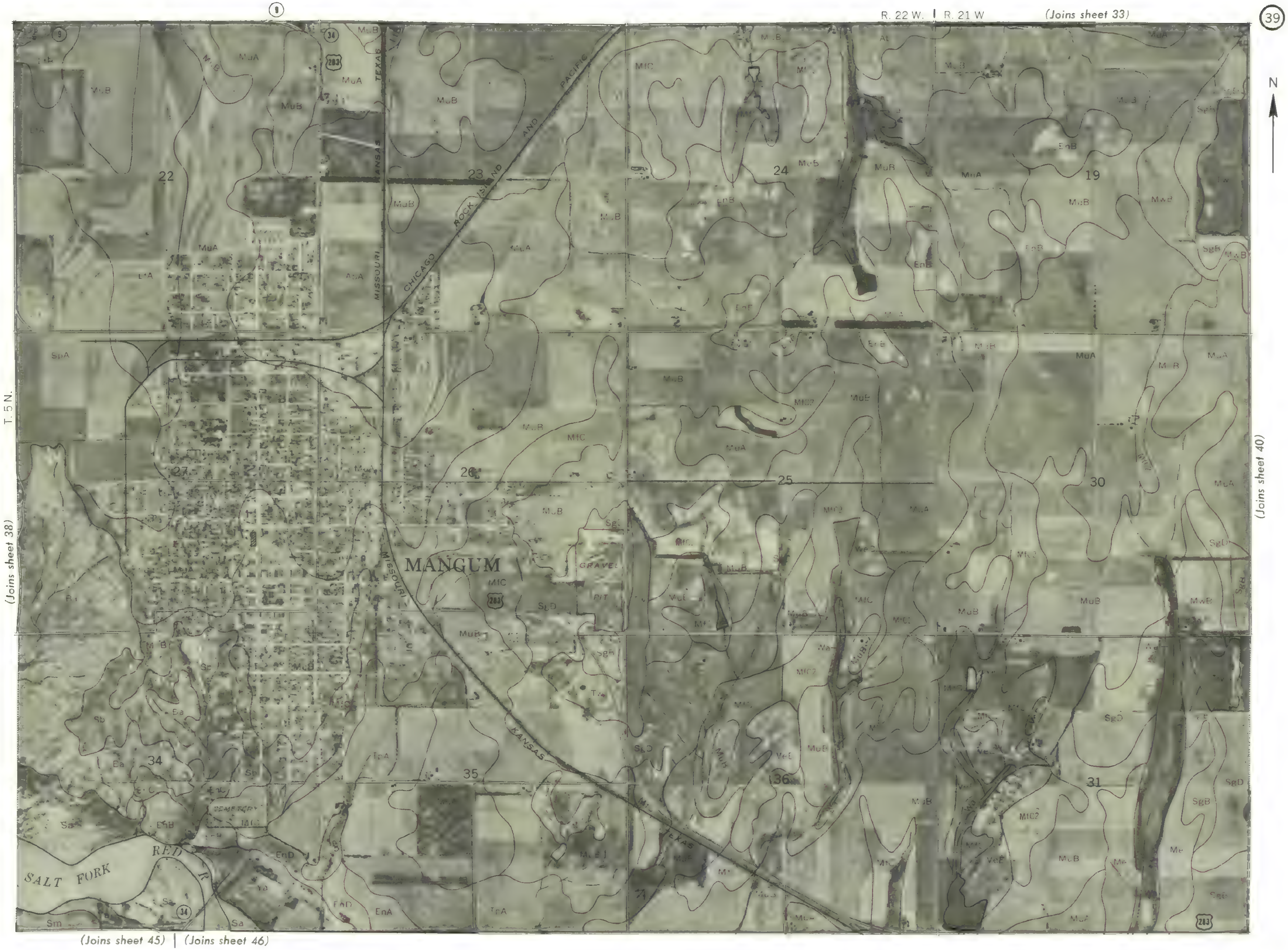
This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station

Range, township, and section corners shown on this map are indefinite

(Joins sheet 43) | (Joins sheet 44)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet


38
(Joins sheet 32)
R. 23 W.
R. 22 W.
N
T. 5 N.
(Joins sheet 37)
(Joins sheet 39)
(Joins sheet 44)
(Joins sheet 45)
24
19
20
21
25
30
29
28
36
31
32
33
SALT FORK RED RIVER
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet



This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station.

Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet


40
(Joins sheet 34)
R. 21 W.
N
(Joins sheet 39)
(Joins sheet 41)
T. 5 N.
ELM FORK
RED RIVER
20
21
22
23
29
28
27
26
32
33
34
35
(Joins sheet 46)
(Joins sheet 47)
0
½
1 Mile
Scale 1:20 000
0
5000 Feet

R. 21 W. | R. 20 W.

(Joins sheet 35)

41

(Joins sheet 40)

(Joins sheet 42)

(Joins sheet 47) | (Joins sheet 48)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Oklahoma Agricultural Experiment Station

Range, township, and section corners shown on this map are indefinite.

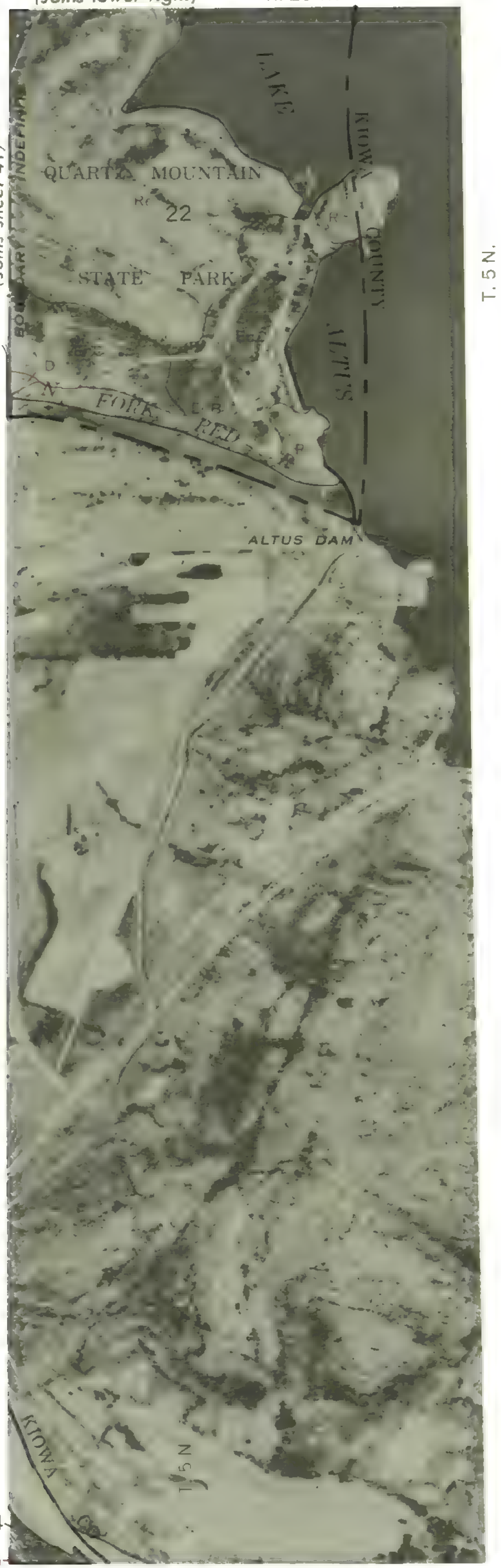
42

(Joins lower right)

R. 20 W.

N

(Joins sheet 41)



T. 5 N.

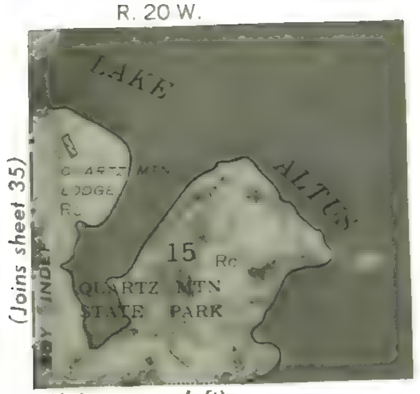
34

Ya

(48)

R. 20 W.

(Joins sheet 35)



T. 5 N.

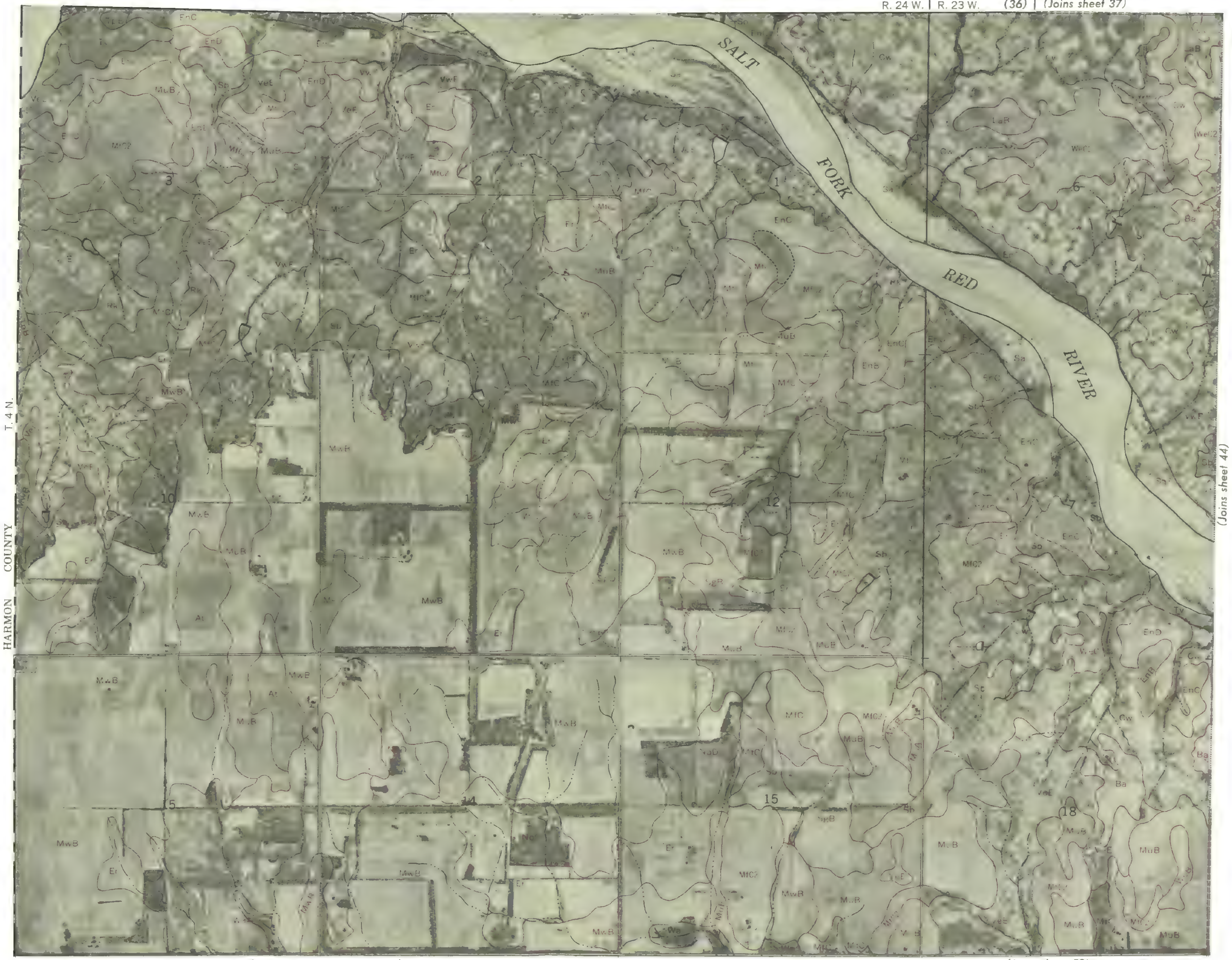
(Joins upper left)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

GREER COUNTY, OKLAHOMA — SHEET NUMBER 43

R. 24 W. | R. 23 W. (36) | (Joins sheet 37)

43



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet (Joins sheet 50)

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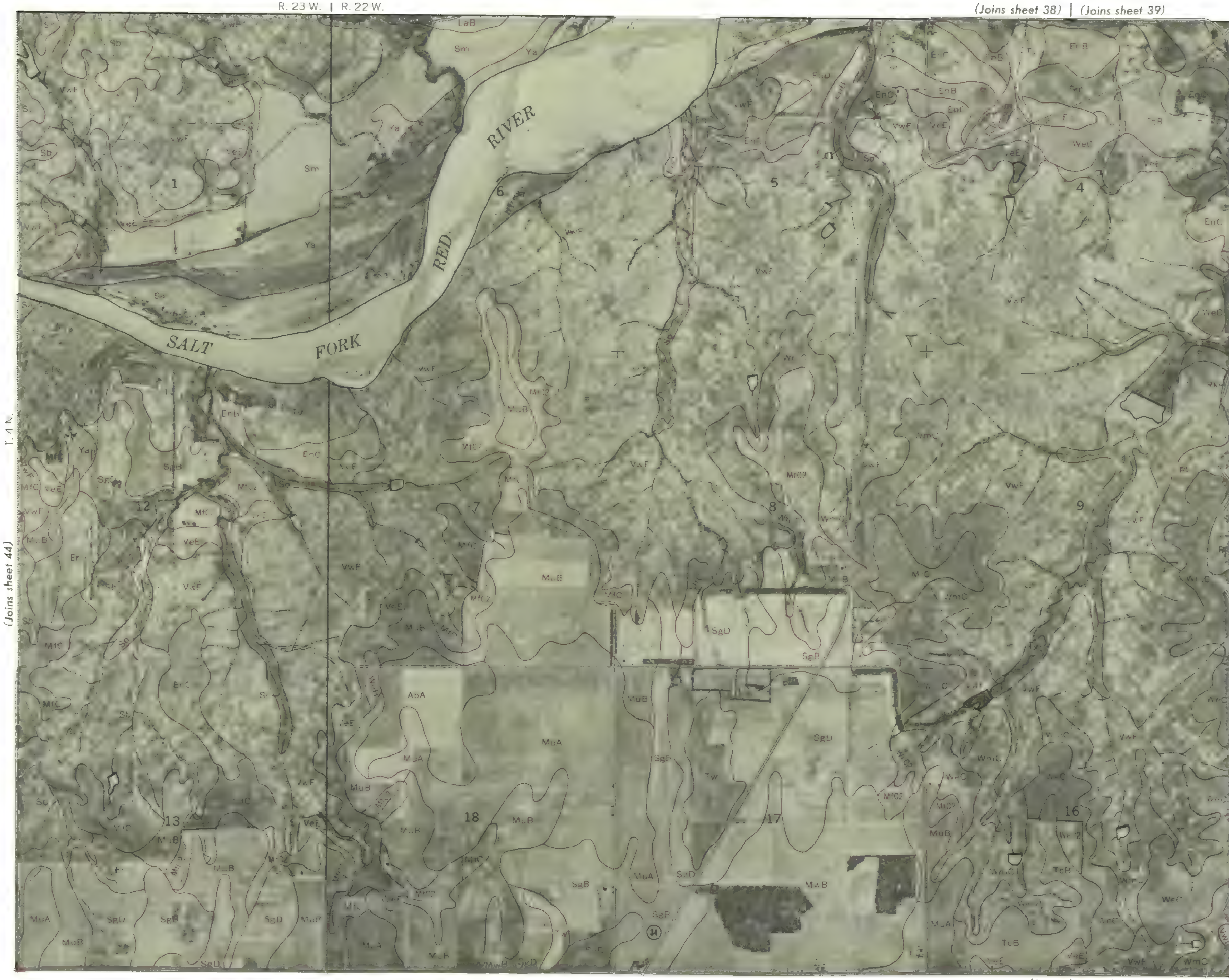
0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

GREER COUNTY, OKLAHOMA — SHEET NUMBER 45

R. 23 W. | R. 22 W.

(Joins sheet 38) | (Joins sheet 39)

45



T. 4 N.

(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 52)

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

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46
N
R. 22 W. | R. 21 W.
(39) | (Joins sheet 40)
(Joins sheet 45)
(Joins sheet 47)
(Joins sheet 53)
T. 4 N.
SALT
FORK
RED
RIVER
MISSOURI
KANSAS
TEXAS
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet

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48
R. 21 W. | R. 20 W.
(Joins sheet 41) | (Joins sheet 42)
(Joins sheet 47)
(Joins sheet 49)
T. 4 N.
N
KIOWA CO.
City View School
WEST CANAL
SANTA FE AND MAIN CANAL
ATCHISON TOPEKA
ALTUS CANAL
JACKSON COUNTY
0 ½ 1 Mile
Scale 1:20 000
0 5000 Feet

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet

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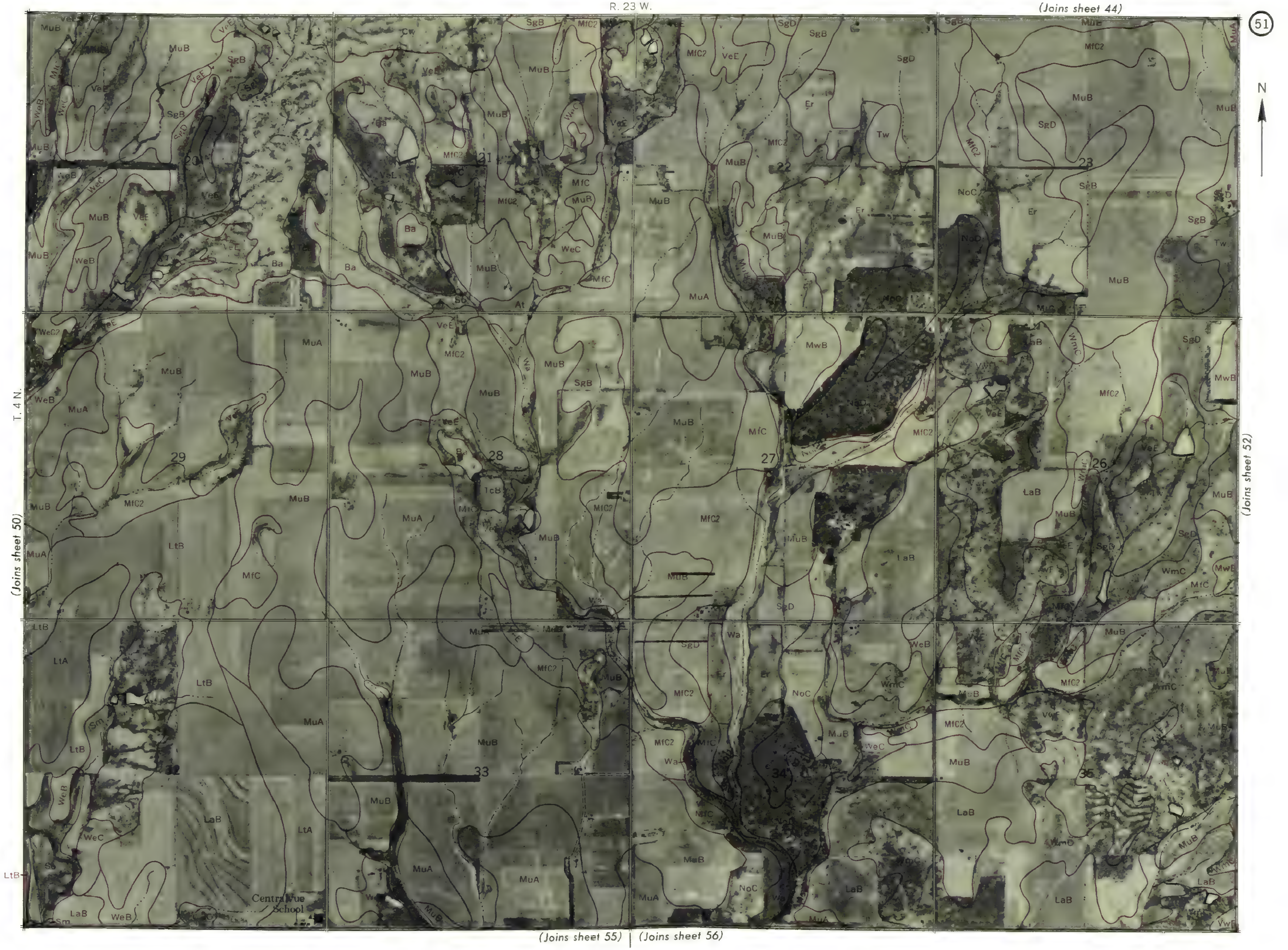
GREER COUNTY, OKLAHOMA — SHEET NUMBER 50

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet



Scale 1: 20 000

0 ½ 1 Mile

0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.


52
(Joins sheet 45)
R. 23 W.
R. 22 W.
N
(Joins sheet 51)
(Joins sheet 53)
T. 4 N.
(Joins sheet 56)
(Joins sheet 57)
0
½
1 Mile
Scale 1: 20 000
0
5000 Feet
19
20
21
24
25
28
29
30
31
32
33
36

53

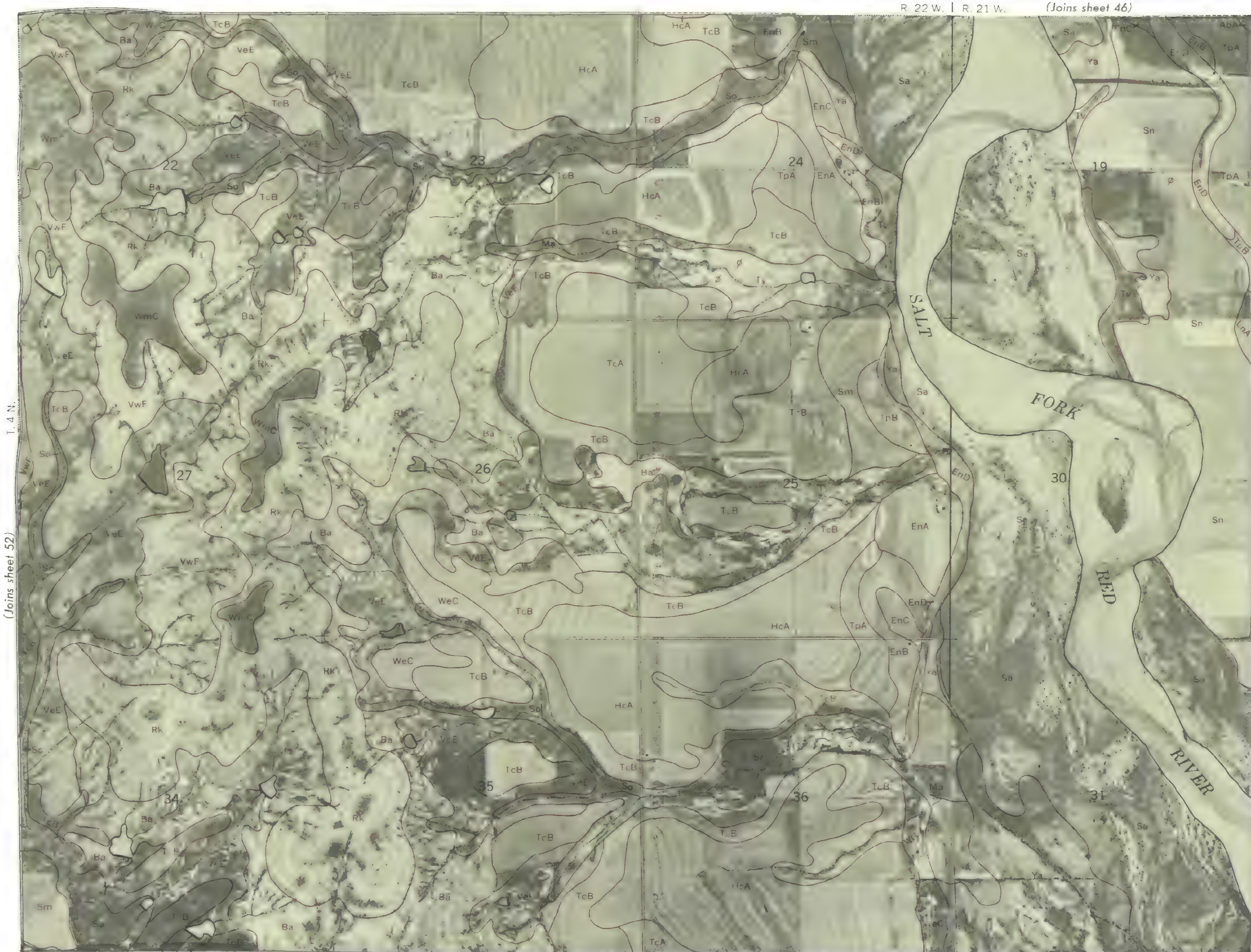
R. 22 W. | R. 21 W.

(Joins sheet 46)

N

T. 4 N.

(Joins sheet 52)



(Joins sheet 54)

(Joins sheet 57) | (Joins sheet 58)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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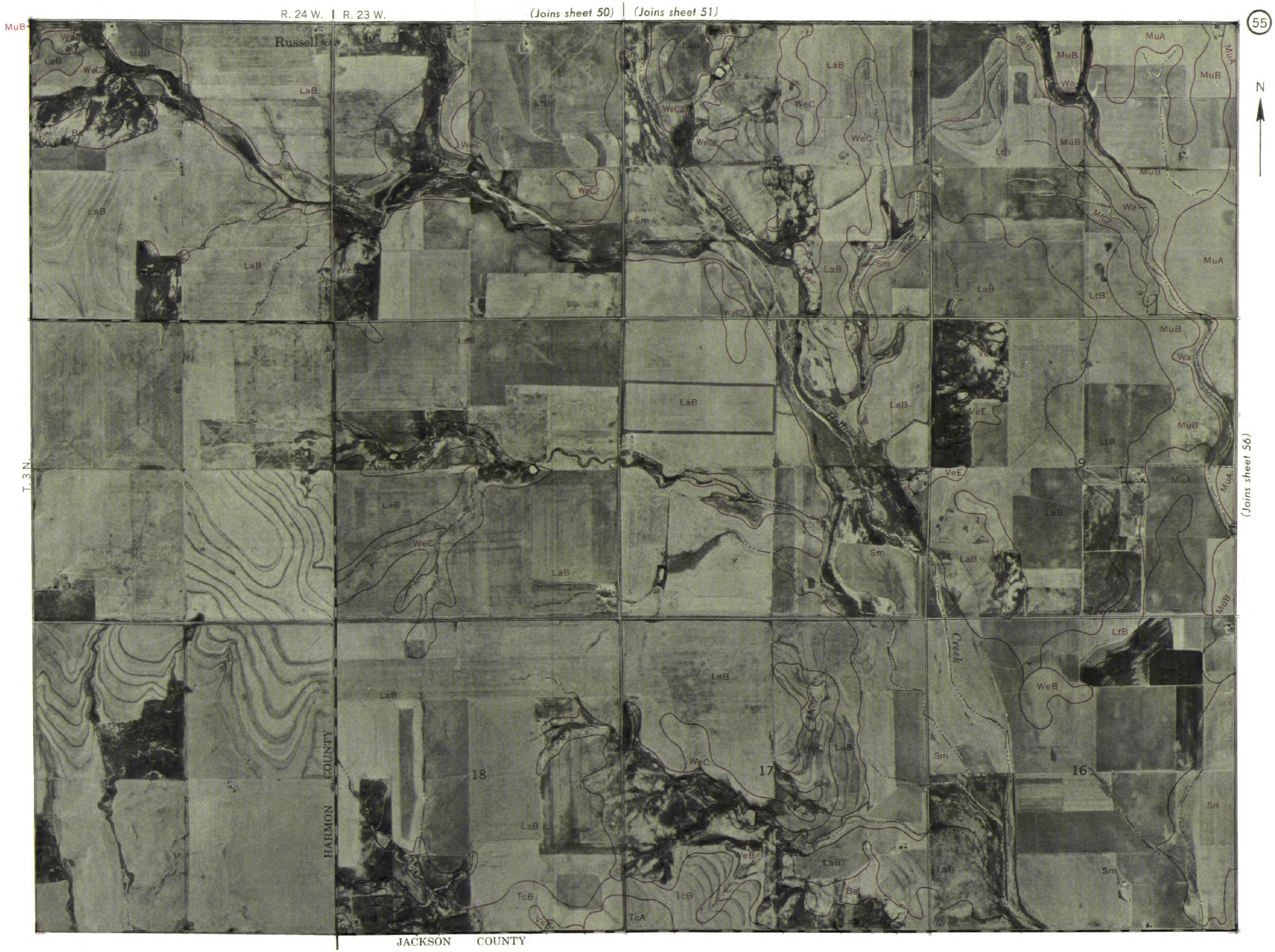
Range, township, and section corners shown on this map are indefinite.

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet



Scale 1:20 000
0 ½ 1 Mile
0 5000 Feet

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Range, township, and section corners shown on this map are indefinite.

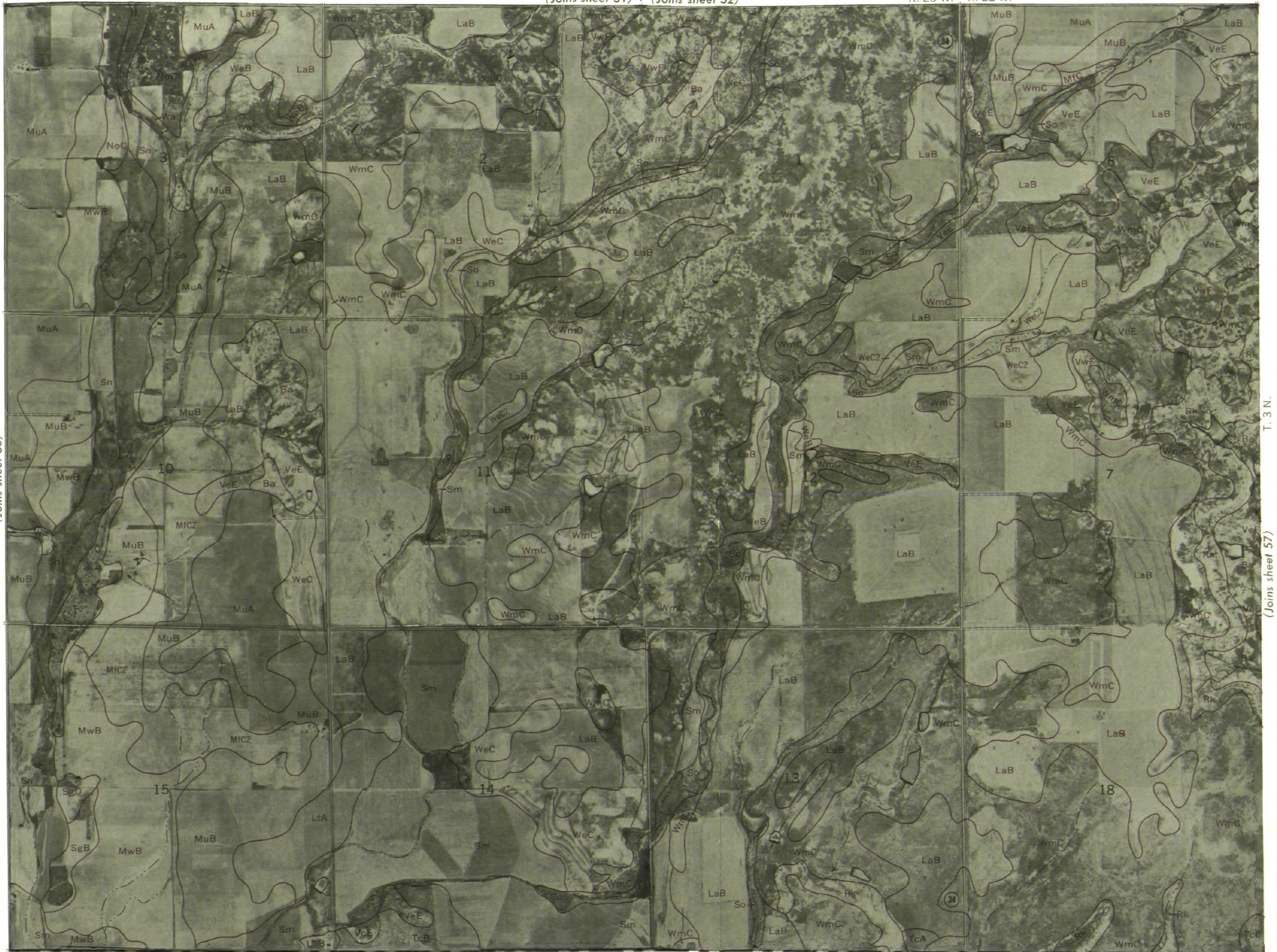
56

(Joins sheet 51) | (Joins sheet 52)

R. 23 W. | R. 22 W.

N

(Joins sheet 55)

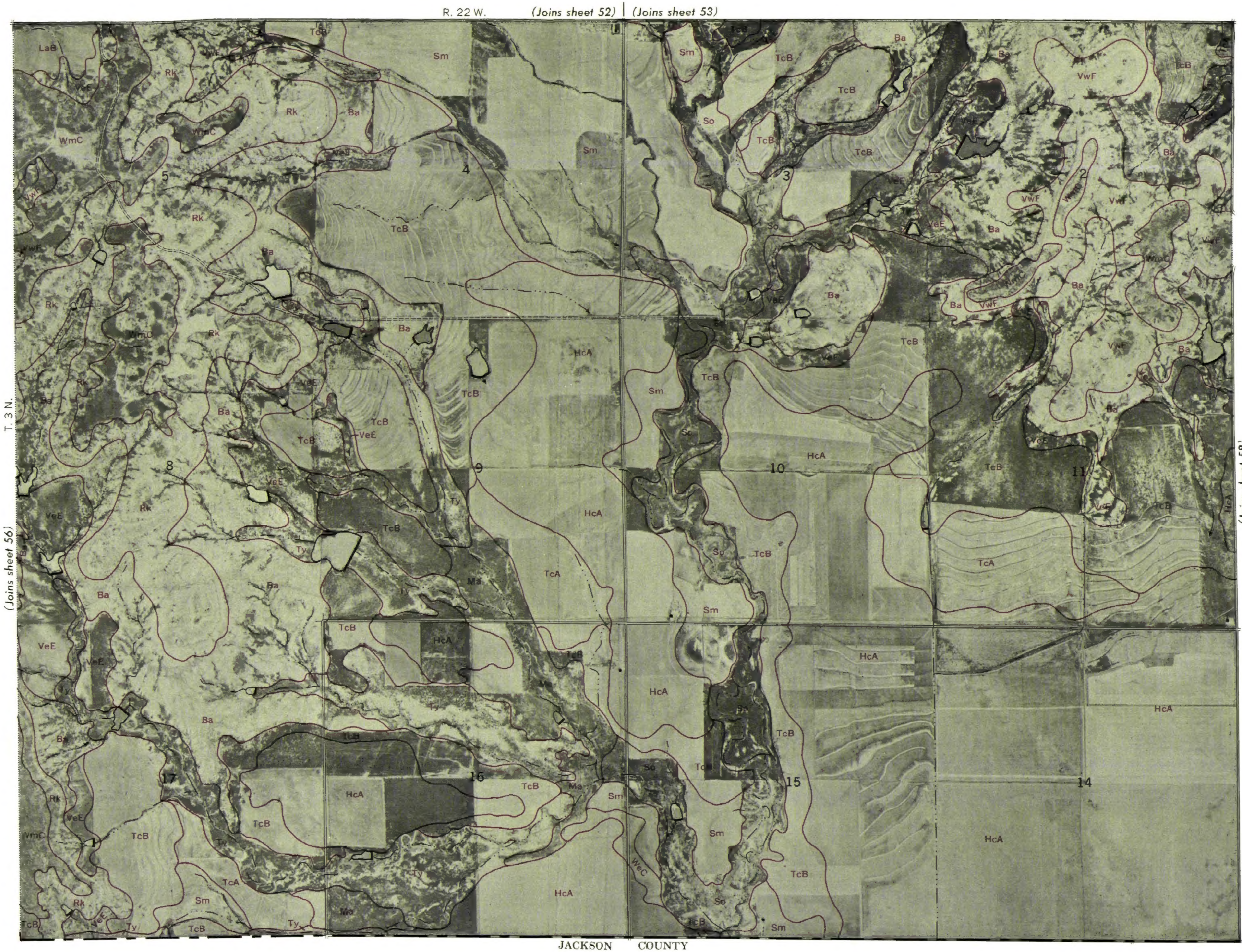


T. 3 N.

(Joins sheet 57)

JACKSON COUNTY

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

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GREER COUNTY, OKLAHOMA — SHEET NUMBER 58

JACKSON COUNTY

0 ½ 1 Mile Scale 1: 20 000 0 5000 Feet